DR. BILDFELL'S LIFE AMONG THE INUIT | SURPRISING JAPANESE PRINTS

ROTUNDA

THE MAGAZINE OF THE ROYAL ONTARIO MUSEUM

volume 35:number 1
2002 summer/fall

Relics of a Lost Civilization

Who created the haunting bronze treasures found smashed and burned in Sichuan, China?

SUMMER / FALL 2002

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COVER IMAGE: BRONZE HUMAN-LIKE HEAD. ONE OF FOUR WITH GOLD FOIL ON THE FACE FOUND IN PIT #2 AT THE SANXINGDUI SITE IN SICHUAN, CHINA. PHOTOGRAPHY: BRIAN BOYLE, ROM

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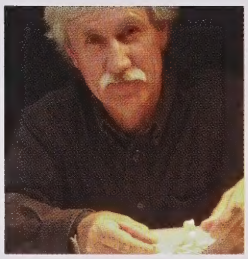


Kenneth R. Lister
Department of Anthropology

KEN ("The Inquisitive Dr. Bildfell") joined the ROM in 1978. Currently he is head of the Department of Anthropology with research interests in the Subarctic and Arctic ethnographic collections, the department's collection of canoes and kayaks, and the Paul Kane collection of paintings and sketches. Ken curated the exhibition *In the Time of the Kayak: Hunting in the Eastern Canadian Arctic* based on his Arctic research, as well as three exhibitions on the work of Paul Kane. In addition to exhibitions, lectures, publications, and radio and television interviews, Ken has produced two videos devoted to the construction and role of the kayak in traditional Inuit culture.

Dr. Radu Cornel Guiaşu
University of Toronto

RADU ("Tunnel Syndrome") is an instructor and research associate in the Department of Zoology, University of Toronto. He has conducted research on the ecology and behaviour of northern crayfish in the field, the laboratory, and museum collections, including the invertebrate collection of the Centre for Biodiversity and Conservation Biology at the ROM.

Akiko Takesue
Department of Near Eastern and Asian Civilizations

AKIKO ("Famous First Impressions") is a visiting researcher from the Art Gallery of New South Wales, in Sydney, Australia, where she was assistant curator of Japanese Art. From August 2001 to July 2002, she volunteered in the Far Eastern section of the ROM's Department of Near Eastern and Asian Civilizations, researching and cataloguing the Japanese collection, mainly prints and ceramic tea utensils.

Dr. Chen Shen
Department of Near Eastern and Asian Civilizations

CHEN ("Relics of a Lost Civilization") is the ROM's Bishop White Curator of Far Eastern Archaeology. Trained in Wuhan, China, his expertise is in use-wear technique—examination of stone tools under microscopes for evidence of how the tools were made and used. He has led the ROM's fieldwork program in China since 1997.

Correction: In the Spring 2002 issue of *Rotunda*, the article "Portraits of Cleopatra" on page 35 was written by Alison Easson, and not by Roberta L. Shaw, as the lack of by-line implied.

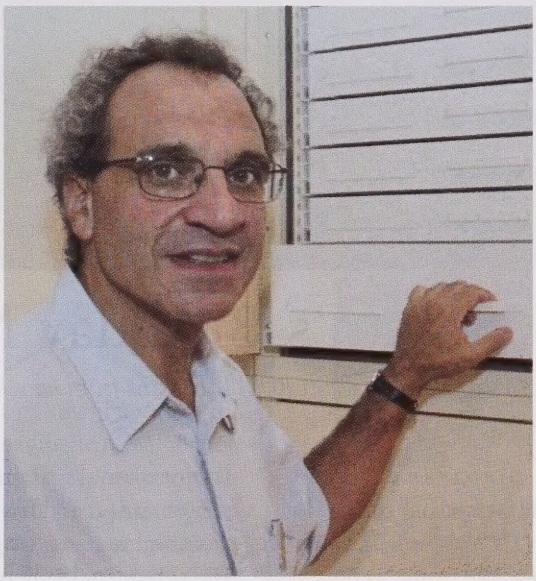
PRESIDENT'S MESSAGE

ROM collection manager Dan Rahimi writes a special guest column for this issue.

THE RENAISSANCE of the ROM may appear to be a pre-eminently public phenomenon, based in bold architecture that will house new exhibits, restaurants, and public spaces. Some of our collections will be augmented and re-interpreted for display in the new crystals, and others will be raised from the Museum's deep stores, brought to the public perhaps for the first time. But behind the glorious new building, in places dark and dusty to public imagination, a current of change in support of the renaissance initiative is beginning to improve conditions for the collections that lie at the Museum's core.

It is well known that the ROM displays only a small portion of its collections. This is normal in a research and collecting institution where many artifacts and specimens are required for scholarly study and active curatorial work. Some collections are broad in their scope, such as the 40,000 textiles from across the world that comprise the Costume and Textiles collection; others focus more narrowly, such as the Old World Prehistory collection, where 13,000 stone tools lie in perfect order in wooden drawers, accessible to curators, students, and researchers but little seen by the general public. And some are more "presentable" than others: while there might be a cry of joy at the rotational display of, say, our Chinese imperial robes or Canadian maps, the exhibition of 64,000 specimens of fish preserved in bottles of alcohol might elicit a different response. Those fish, however, are no less essential to the mission of the Museum than the beautiful costumes, and all require careful and specialized housing.

It is not difficult to imagine that the care of our nearly four million natural specimens and one million artifacts requires an enormous amount of space and organization and that, at some level, the need for housing resources competes with the need for exhibition funding. Happily, these two worlds are not mutually exclusive, and while the design of the new crystals blazes forward, significant changes are also being made on the collection-housing front. Some collections are being re-located and re-housed in sparkling new state-of-the-art facilities.



Dan Rahimi, ROM's collection manager, in the revamped Ethnology collection room.

The impetus for some changes comes from unlikely places. For example, Ontario recently adopted the National Fire Code of Canada, which has established stringent new regulations regarding the storage of hazardous liquids. The 64,000 inebriate fish (we call them the "alcoholics") fall into this category, because they are stored in an 80 percent ethanol solution. The provincial government is helping us construct a new off-site facility to house most of the collection, in order to comply with the new code. About 1350 square metres (15,000 square feet) of storage space will be devoted to the fishes and reptiles, which will be shelved and protected by sophisticated anoxic fire-control systems. For research in-house, a new laboratory, storage, and dispensing unit will be provided above ground at the Museum, complete with spark-less light switches, huge fume hoods, and electrically grounded stainless-steel counters. Enough specimens will be legally housed on-site to support ongoing research, while the majority of the collection will move to the new facility.

Period furniture, hazardous in no way but to the bank accounts of collectors, presents an equal storage challenge. The Museum's significant holdings of European and Canadian furniture occupy more than 1350 square metres (15,000 square feet) of storage space. Their housing needs are dramatically different from those of the alcoholics. Furniture requires stable humidity and temperature; we aim for 45 percent relative humidity and 20°C, and about 540 square metres (6000 square feet) of carefully climate-controlled space will be created at the new collection-housing facility to hold some of our finest furniture. The remainder will be housed, as it is now, in rented accommodations.

Finally, we are in the midst of renovating the Ethnology collection room. For the first time, thanks again to provincial funding, the ROM has been able to acquire the finest museum-quality cabinets of powder-coated steel, stacked to the ceiling and mounted on movable carriages, to hold our magnificent ethnographic collections from North America, Africa, the Pacific and South America. The floor is concrete topped with epoxy, the cabinets are sealed against insects, the room is bright and spotless. It warms a collection manager's heart.

BRIAN BOYLE, ROM

DON DAVIS, ROM / M29167

Solar System's Birthday Nailed

Precise dating methods win ROM lab grant from space agency

THE EARLIEST MINERALS TO CONDENSE out of the nebular gas cloud that eventually formed our solar system have recently been dated by Dr. Yuri Amelin at the ROM's Jack Satterly Geochronology Lab. The result, 4567.4 ± 0.5 million years, makes the ROM's date slightly older than previous dates on such minerals and ten times more precise—making it the oldest mineral age ever measured.

The age was obtained by measuring the amount of lead accumulated from the decay of uranium in minerals from primitive meteorites called carbonaceous chondrites. These meteorites are composed of the same raw materials from which the planets, including Earth, eventually formed. Dating these minerals is difficult because they contain only minute amounts of uranium and lead, measured in parts per billion.

For the past two years, Yuri has been applying methods of low-contamination uranium-lead dating—developed at the ROM geochronology lab for dating terrestrial rocks—to the problem of meteorite formation ages. Attempts by previous researchers to date meteorites relied on trace minerals called phosphates, which contain larger amounts of uranium. However, phosphates are relatively rare. Worse, they often give too young an age because the violent collisions and thermal events common in the early solar system could easily re-set their uranium-lead clocks.

Yuri discovered that uranium and lead in the mineral orthopyroxene, which is a major component of most stony meteorites, can also be used for dating and is much more resistant to re-setting. Other labs had not succeeded in using this mineral because its lead content is too low to be measured without significant laboratory contamination. Yuri and his student assistant, Ethan Rotenberg, are now attempting to establish a precise chronology of early solar-system development using the extensive meteorite collection in the ROM's Earth Sciences Department as well as specimens obtained from outside collections.

This work is likely to have a profound impact on science's understanding of planetary formation. Accordingly, the Canadian Space Agency has granted $160,000 to support isotopic studies on meteorites at the ROM over the next three years. The CSA is developing a new initiative to create a Canadian Astromaterials Facility that will curate and study specimens obtained from missions to Mars, the Moon, and the asteroid belt. More specimens may be forthcoming from internationally sponsored missions being planned by NASA and the European Space Agency for the end of this decade. Yuri's work puts the ROM Geochronology Lab in the forefront of research on extraterrestrial materials and ensures that the ROM will be a leading collaborator in the establishment of the Astromaterials Facility.

—Don Davis

TIMOTHY SMITH / HD5599

Beyond Bridle Fashion?

Blood Indian accessory may have charmed spirits

An object's value can be a matter of perception. One of the most intriguing pieces in the ROM's Plains Indian collection was described by its collector as a "cheap ornament" to attach to a horse bridle. This hardly captures the thought and effort that went into the piece, pictured above, collected from the Bloods, a division of the Blackfoot Indians. This group, which formerly subsisted by hunting buffalo on horseback in southern Alberta along the Montana border, developed complex practices centred on the well-being and performance of their horses, including a powerful horse medicine cult. Practitioners constructed bridle charms to make a horse lively in the Riding Big Dance, to protect it in warfare, and to increase its speed and sure-footedness on the buffalo hunt. The charm's power rested largely in the pouches of medicine tied to the cross-stick; the feathers and fringe were secondary. Whether the medicine pouches were removed by the former owner or were never there, the ROM example is without them. One Blackfoot informant, Bad Old Man, suggested in 1919 that the bridle charm or "cross fringe stick" made to be tied to the "jaw strap of a horse bridle was just like sleigh bells, horse bonnets, or cougar skin saddle blankets—just decoration." Since there appears to be only one other such bridle decoration / charm in existence, we may never know for sure whether this particular piece was used as horse medicine or was simply decorative. The information connected to our artifacts is critical; the more we can learn about them, the greater their value.

—Arni Brownstone

BRIAN BOYLE, ROM / 927.28.107

Hammering Out an Answer

ROM mallet mystery takes maritime twist

In the early years of the last century, ROM founder Dr. C. T. Currelly purchased objects retrieved from the River Thames in London, England, from London antiquities dealer G. F. Lawrence. Likely based on the now-missing receipt slip Lawrence provided, one object was described as "a bone/antler hammer" of Neolithic or Bronze Age date (c. 4000 – 700 BC). But a student's doctoral research in 1997 revealed that the hammer was actually wood (likely ash), impregnated with wax or the like, commonly used for wood preservation in former days. Comparing it to other mallets from London and examining the method used to drill the hole through its centre dated the mallet to the post-Medieval period—that is, no earlier than 1500 AD. But lest we think the item is diminished in archaeological value, consider that these mallets were used to build ships and the gathering might of the British Navy at the time.

—Fiona Haughey

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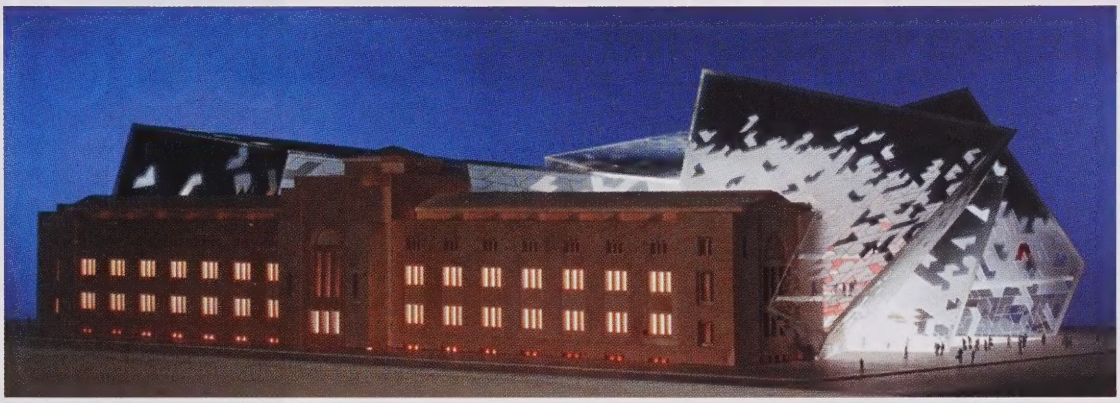
Architecture: Homage to the Past and Future



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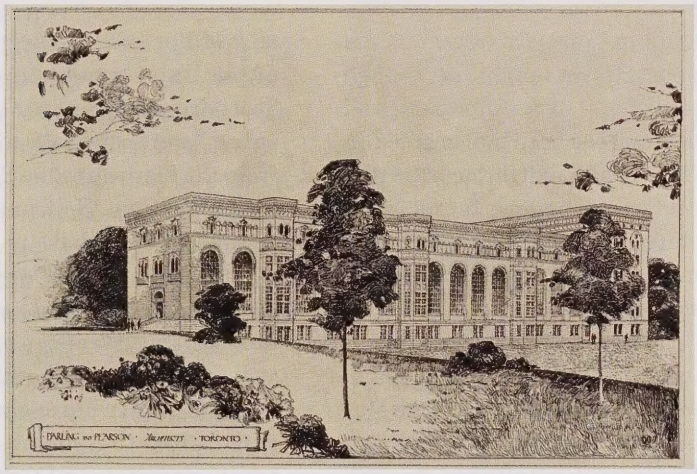
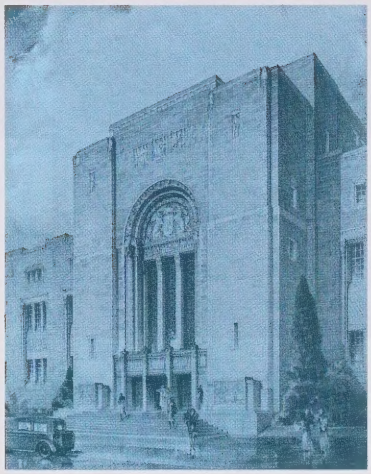


ROM ARCHIVES



ROM ARCHIVES

Architects' concepts of the ROM: (upper) projected for 2005; (lower, left to right) Bloor Street perspective, 1912; entrance, Queen's Park wing, 1931.

THE ARCHITECTURAL resurgence of Toronto, and its power to attract, were abundantly evident early this year when thousands of friends of the ROM filled Samuel Hall ❀ Currelly Gallery and Eaton Court to hear the presentations of the three architects shortlisted for Renaissance ROM (from an international field of 52). A major Canadian cultural initiative, Renaissance ROM will dramatically enhance access to the Museum's collections, showcasing and celebrating the arts of humanity and the natural world, and making the ROM an essential destination.

ROM Architecture

The most visible aspect of Renaissance ROM will be architecture. Daniel Libeskind's winning design, inspired by the ROM's mineral collections, will restore the Museum's original Bloor Street access. The historic 1912 and 1931 buildings will be honoured as their soaring windows and vaulted ceilings are reclaimed to reveal the great exhibition halls intended by the Museum's founders. Renaissance ROM will link past, present, and future in an organic unity, a continuum of vision. It is about responsibility to the past and responsibility to the future.

The original yellow-brick ROM, running north to south alongside Philosophers' Walk, opened to the public on March 19, 1914. Its design,

BY GLEN ELLIS

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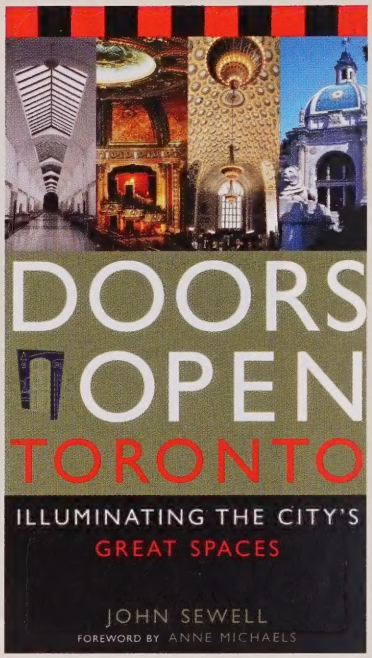
Doors Open Toronto: Illuminating the City's Great Spaces

By John Sewell
Foreword by Anne Michaels
(Knopf Canada, Paper: $27.95)



MY EARLIEST ANCESTORS in Canada left Wiltshire, England, in 1831 and arrived in Muddy York later that year. Their forebears had inhabited the same locale for centuries, perhaps longer. When the Industrial Revolution took the wool industry north, in the first third of the 19th century, the economy of southern England collapsed, spawning agricultural riots and the burning of hay ricks. Some English left the south and west for the factories, others emigrated, many to Upper Canada. From the time of Governor Simcoe, English traditions in architecture and building had been transplanted on Ontario turf, and through the 19th century and beyond, Toronto's architecture, where materials permitted, largely mirrored that of the sceptred isle.

This year's Doors Open Toronto, and the corresponding book, were launched at the ROM on May 24. Doors Open began in a small French town in 1984 and "by 1998 some nineteen million visitors had visited twenty-eight thousand sites in forty-six European cities." And it grows yearly. The numbers are an indicator of the vast appeal of heritage architecture.

John Sewell's essays are incisive and readable. The landmarks range across the larger city, from the Loyalist Georgian Montgomery's Inn in Etobicoke, to the Gothic Revival Zion Church Cultural Centre (originally the Zion Primitive Methodist Church) in North York, to the Arts-and-Crafts home of Toronto industrialist Miller Lash on the grounds of the University of Toronto at Scarborough. This year's "great spaces" were especially diverse—from the Flatiron to the Rosewater Supper Club, Heliconian Hall to Roy Thomson Hall.

The Guild Inn's Spencer and Rosa Clark laboured, even in their advanced years, to preserve at least exquisite fragments of Toronto architecture slated for demolition, but many of the city's architectural treasures have been lost, and many picturesque Victorian residences are uninhabited and decaying. The overwhelming success of this year's Doors Open Toronto, and John Sewell's excellent book, enhance awareness of the rich fabric of Toronto architecture and its *value* to the city—to Torontonians, to investors, and to tourists.

It is to be hoped that this awareness will contribute to the preservation and restoration of our best architecture.

—Glen Ellis

celebrated as "a daring essay in modernity," and "a new note in the architecture of the city," departed dramatically from the brownstone domestic buildings it faced directly across Bloor Street and the Gothic towers of McMaster University, now the Royal Conservatory of Music.

Work on the Queen's Park wing began in 1931, two years into the Great Depression. The Province of Ontario stipulated that, where possible, Ontario labour and materials should be employed. The Queen's Park walls were made of limestone brought from Queenston, Ontario, and Credit Valley sandstone, quarried near Terra Cotta. Marble columns, trim, and flooring were quarried from Marble Lake, south of Bancroft. The height of this great stone longhouse was determined by that of the West Coast Nisga'a and Haida totem or crest poles, around which the stairwells were constructed.

The crystalline 2005 building, by Studio Daniel Libeskind, to be constructed in partnership with Bregman and Hamann Architects, is envisioned as "a luminous beacon, a showcase of people, events, and objects." The full extent to which Libeskind has translated naturally occurring mineral forms and textures into architecture is revealed by a glance at calcite specimens in the ROM's collections. A piece of Ontario calcite from Bancroft, for example, exhibits almost precisely Libeskind's pattern of alternating opacity and translucency, the same nuances of light—shifting to shade, shifting to light. The shapes of calcite rhombohedra are mirrored especially. It is as if Libeskind pulled his forms out of the Canadian Shield and set them down in Toronto.

In connection with Renaissance ROM, this edition of Libris is dedicated to books about architecture.

William Thomas, Architect, 1799–1860

By Glenn McArthur and Annie Szamosi (Carleton University Press, distributed by Penumbra Press, Paper: $39.95)

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be his most remembered building today, but the legacy of architect William Thomas includes churches, breweries, jails, villas, houses, warehouses, courthouses, shops, offices, and the Brock Monument at Queenston, Ontario. Born in Suffolk, England, Thomas emigrated to Toronto in 1843. From then until 1860, he made his mark in eastern and central Canada, and many of his buildings have survived. In the words of the authors: "His church spires pierce the sky, his public buildings dominate town blocks, often his stores are the most fashionable places to shop, and his residential designs are artfully placed within their settings." The book is lavishly illustrated. One especially striking visual is the façade of Thomas's Commercial Bank of the Midland District, which has been preserved in Santiago Calatrava's cathedral-like glass atrium of Toronto's BCE Place.

Kensington

By Jean Cochrane
Photographs by Vincenzo Pietropaolo
(Boston Mills Press, Cloth: $39.95)

One seldom (if ever) associates the Governor General's Horse Guard with Toronto's Kensington district, but its ancestor was Denison's Horse, a militia unit formed by George Taylor Denison I, the original King of Kensington (long before it was Kensington). Bellevue Square (where a statue of actor Al Waxman was unveiled by Toronto mayor Mel Lastman earlier this year) was in Denison's day an occasional military parade ground. Denison once publicly offered to give Toronto's first mayor, William Lyon Mackenzie, "a slap in the chops." Robert B. Denison, George's son, donated both the land and funds to build St. Stephen's-in-the-Field Anglican Church in 1858.

Drawing on archival records and personal recollections, Jean Cochrane's visually evocative labour of love traces Kensington's history from its Britannic origins through its later street-market incarnation and multicultural diversity.

A Pattern Language: Towns, Buildings, Construction

By Christopher Alexander et al.
(Oxford, Cloth: $113.95)

Unprepossessing in format, and illustrated by black-and-white photographs on non-coated text stock, *A Pattern Language* succeeds (in its total of more than 1200 pages) in substance *sans* glitz. It is about the principles of creating habitats and spaces that work for people. From the criticality of access to sun and water—the latter varying from ocean to fountain—to ceiling-height variety and cascading roofs, to secret places, the authors draw upon an international gallery of spaces that work, that nourish and sustain. Many of the concepts defy conventional practice. Consider this: "Never place buildings in those places which are most beautiful. In fact, do the opposite. Leave those areas that are most precious as they are, and build new structures in those parts of the site which are least pleasant now."

Also Recommended:

A fount of essential terminology, the *Oxford Dictionary of Architecture (by James Stevens Curl, Oxford, Cloth, $66.50; Paper: $26.50)* is also a trove of the arcane and esoteric. Insist on *zoöphoric columns* in your menagerie, *anthemia* in your arboretum.

Nicola Coldstream's *Oxford History of Art: Medieval Architecture* (Oxford, Paper: $31.95) deftly portrays the relationship between patron and builder, as well as the mechanics of process that lead, as if inevitably, to divine achievement.

One of the very best books about church architecture in Ontario, and an important addition to the architectural canon, *Sacred Space and Structural Style: The Embodiment of Socio-Religious Ideology* (by Vicki Bennett, University of Ottawa Press, Paper: $29) is about turning "the word" into stone, the expression of faith through architecture.

Glen Ellis is head of Publications, Royal Ontario Museum.

Time for Global Change

Nearly a century has passed since scientists first predicted severe upheavals in Earth's atmospheric conditions. Evidence of this in the form of global warming is becoming clearer each year. Is it too late to reverse the dangerous trend?

TIM ZELTNER / I2IART

MARY BURRIDGE

THERE IS NO DOUBT that our climate is changing. It has been nearly a century since scientists who observe Earth's atmosphere first predicted an environmental upheaval that would cause declining populations for many species. Today, that prediction is quickly becoming a reality as melting ice, rising sea levels, and changing seasons are beginning to leave plants and animals stranded in unfavourable environments.

These changes are largely due to the "greenhouse effect," which warms Earth's temperatures when certain gases in our atmosphere—including carbon dioxide, nitrous oxide, methane, and water vapour—trap the sun's heat like the glass panels in a greenhouse, keeping them close to the Earth's surface. Without these "greenhouse gases" Earth could not retain heat and it would be too cold for human life. The greenhouse effect is natural and necessary for our survival. For the past 250 years, however, since the Industrial Revolution, human activities have brought about an ever-increasing accumulation of greenhouse gases, which in turn is causing more and more heat to be trapped in our atmosphere.

From Costa Rica's cloud forest to the Arctic Ocean, the effects of climate change on biodiversity are becoming increasingly visible. Since 1987, 20 out of 50 frog species have disappeared from Monteverde's cloud forest in Costa Rica and the blame appears to lie with unusually hot, dry weather linked to rising sea temperatures. Researchers think that the frog's immune systems were weakened, leaving them vulnerable to epidemics of parasites and pathogens. Similar trends have occurred in the Cascade Mountains of Oregon, where the boreal toad was overcome by a lethal fungus caused by warming Pacific Ocean waters. In Hawaii, mosquito-borne malaria may be poised to eliminate the island's famous honey creepers. The birds' home in Hawaii's cool mountain forests is warming up to be an ideal climate for mosquitoes.

The effects don't stop on land either. In the El Niño year of 1998, record-high surface temperatures occurred across the tropical oceans, turning coral reefs white and killing up to 10 percent of the world's coral. In Canada's Arctic, the projected northward shift of permafrost will harm

wildlife through increased sedimentation of rivers and lakes and altered water flow. Earlier summer break-ups and later fall returns of the ice pack mean shorter hunting seasons. Polar bears lose 10 kilograms for every week subtracted from their hunting season by early pack-ice break-ups, and lower weights invariably lead to poor cub survival. Fish, seals, and seabirds have already experienced huge die-offs and shifts in species abundance.

Unless we address the issue, more problems are in the offing. Approximately one-half of North America's wetlands are in the Northwest Territories, Yukon, and Alaska. Most of these presently rest on permafrost. A warmer climate will cause wetlands to diminish, with a corresponding loss of breeding and foraging habitats for migratory waterfowl and mammals.

Scientists are trying to unravel the complex web of events that may have led us to such a precarious situation, but the clues consistently bring us back to changing ocean circulation and a warmer climate as the culprits. Worldwide, scientists agree that human activities are an important contributing factor in climate change.

The main greenhouse gas emitted by human activity is carbon dioxide. The burning of fossil fuels for power generation and transportation is one of the largest sources of carbon dioxide emissions. Such emissions are further exacerbated by deforestation. This works in two ways: carbon dioxide is released from felled trees when they are left to decay or burn; as well, living trees and green plants take up carbon dioxide and give off oxygen during photosynthesis. The more trees that are felled, the less carbon dioxide that is removed from the atmosphere.

This past year, residents of southern Ontario enjoyed an unusually warm winter with very little precipitation, and many of us were uneasy at the thought that it was a sign of things to come. Although we hail milder winters, the hotter summers that are part and parcel of this warming trend are not so welcome. Environment Canada is predicting that Toronto could begin to experience 50 days with temperatures above 30°C each year instead of the current average of 10 days. These high temperatures in turn lead to poor air quality, a significant health risk.

Reversing the effects of global warming is a daunting task. In 1992, 167 nations ratified the Framework Convention on Climate Change, which led to the Kyoto Protocol—the first international attempt to put legally binding limits on greenhouse-gas emissions from developed countries. The Protocol aims to cut the combined greenhouse-gas emissions from developed countries by 5 to 8 percent below their 1990 levels by 2012. As an interim goal, all industrialized nations that ratify the accord must show progress under the Protocol by 2005.

But a nonbinding commitment to reduce greenhouse-gas emissions back to 1990 levels by the year 2000 has come and gone, and for the most part, this first step has failed. Canada signed the Kyoto Protocol in 1998 and as one of the leading industrialized nations is slated to cut emissions to 6 percent below our 1990 level by 2012. Our present emission rate is 17 percent above this target and has not improved since 1998.

Canada has not ratified the Kyoto Protocol. The prime minister does not want any region of the country to bear a heavier burden of climate-change initiatives. Our nation isn't alone in its hesitance to ratify the Protocol: there's no doubt that making this commitment raises serious questions. Can industrialized nations find a balance between economic development and resultant energy use and still respond to climate-change concerns? Can nations reduce their greenhouse-gas emissions without hurting their economies? How can the world's nations most equitably share the protection of our climate? On the other hand, without serious emission cuts we are all in for the "dangerous climate interference" that will result.

The sobering fact remains that even if the Kyoto Protocol is ratified and all nations abide by the terms, this will only slow down the buildup of greenhouse gases. A consensus is emerging among scientists that a plan well beyond the scope of the Kyoto Protocol is necessary. Stabilizing greenhouse-gas emissions at twice their pre-industrial level is considered an acceptable benchmark; however, this would require a global decrease in emissions by 60 percent of 1990 levels. It is hoped that the Kyoto Protocol will stimulate new energy reforms beyond 2012.

While big changes will require the cooperation of world governments to succeed, individuals can still make an impact. In Canada, it is estimated that individuals and families produce 30 percent of the nation's greenhouse-gas emissions from everyday activities such as driving cars, heating and lighting homes, and eating foods that are processed and packaged. Each Canadian currently produces about five and a half tonnes of greenhouse-gas emissions per year, and this figure is on the increase. There are many things that we can do to reduce greenhouse-gas emissions; turning off lights, TVs, and computers, avoiding idling vehicles for more than 10 seconds, and walking or biking for short trips all help. As an example, making our homes more energy efficient can reduce an average family's energy use by 25 percent and reduce greenhouse gases by 4.4 tonnes a year. Planting trees and shrubs is another action that improves air quality by cooling the ambient temperature, filtering out dust and greenhouse gases, and reducing energy consumption. It is estimated that two mature trees provide enough oxygen for a family of four. It is imperative that we all do our part. To learn more about climate change and what you can do to help, visit the Government of Canada's Web site www.climatechange.gc.ca.

Mary Burridge is an assistant curator of ichthyology in the ROM's Centre for Biodiversity and Conservation Biology and coordinates public programming for the Hands-On Biodiversity Gallery.

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ROM TRAVEL

By Chen Shen

A farmer's accidental find offered the first clues to the existence of a mysterious ancient people. The discovery would rewrite the history of ancient Sichuan.

Right: Archaeologist Chen De'an, now director of the Sanxingdui Archaeological Work Station,is shown here in 1986 with local villagers, triumphantly displaying a magnificent bronze head that has just been unearthed from one of the sacrificial pits at Sanxingdui.
Opposite page: A bronze bird head ca. 1200 BC, excavated from Sanxingdui pit #2 in Sichuan, China.

THE SICHUAN PROVINCIAL INSTITUTE OF ARCHAEOLOGY

Relics of a Lost

On a spring day in 1929, farmer Yan Daocheng and his 30-year-old son were digging a water ditch behind their farmhouse in the western Sichuan village of Yueliangwan, China, when their picks hit something hard. Scraping away the soil, they were astonished to discover a cache of more than 400 pieces of jade and stone wares—some of them later determined to be ancient ritual objects—buried in the earth. Mr. Yan felt fearful of the consequences. Would the find bring good or bad luck? The family re-buried the objects in a safe place away from their house.

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Civilization

The Yans could not have realized that the relics they had uncovered, and eventually donated to Sichuan University Museum and Sichuan Provincial Museum in the 1950s, were the first clues to the discovery of a mysterious ancient people: a Bronze-Age civilization dating back more than 3000 years, which, until this find, was unknown to historians and archaeologists. It was a discovery that would rewrite the history of ancient Sichuan and transform the sleepy nearby town of Guanghan into a bustling tourist destination.

Late in February 2000, my ROM colleague Klaas Ruitenbeek and I arrived

Smash and Burn

Would an Ancient Culture Destroy its Own Bronze Treasures?

Since the discovery of two enigmatic pits at Sanxingdui in Sichuan, China, scholars have advanced many theories about the pits' function—and the debate continues. Some believe the pits—dug up in 1986 and found to contain never-before-seen types of stone and gold artifacts, bronze figurines, masks, ritual objects, animal bones, jades, and more—represent a type of burial without human remains, noting that the objects must have belonged to a high-status person such as the one represented by a bronze standing figurine found in one of the pits—the first and only known life-sized statue of a human figure from Bronze-Age China and likely representing a king or religious leader.

Chen De'an, head of the Sanxingdui Archaeological Work Station, however, points out that during a decade of investigation, archaeologists have found no other burials of this kind in the area. In addition, he argues, even considering the cultural differences between this group and those of central China, the pits seem too small and informal for the burial of a high-status owner. In elite burials in central China, the pit is a deep, elaborate cross-shaped structure with ramps descending into it and separate chambers for the offerings and the tomb occupant.

Another hypothesis is that the objects were burned, smashed, and buried because it was thought that they had lost their magical power or might bring misfortune. This theory suggests either that a new ruler

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Above: Archaeologists worked around the clock for weeks to excavate the pits at Sanxingdui, which were discovered in 1986. The pits were filled with bronze and jade artifacts of a type never seen before. **Right:** Bronze mask with a trunk and protruding pupils, ca. 1200 BC. Such masks are thought to represent gods worshipped by the Sanxingdui people.

in Guanghan. We had come to research the remarkable Bronze-Age archeological site—now known as Sanxingdui—in preparation for an exhibition called *Treasures from a Lost Civilization*, which opens at the ROM this fall, displaying some of Sanxingdui's treasures. Klaas and I were especially interested in seeing the place where two astonishing sacrificial pits had been uncovered in 1986, revealing unique works of bronze and other puzzling ritual items.

Inside the modern and dramatically lit Sanxingdui Museum—newly built to house the still-growing collection from the site—we were greeted by archaeologists from the Sichuan Provincial Institute of Archaeology. The party included Chen De'an, one of the first to excavate Sanxingdui, and now director of the Sanxingdui Archeological Work Station. Because of the fame of Sanxingdui's treasures, Chen De'an has probably hosted more national leaders and academic professionals than any other archaeologist in Sichuan. We were honoured to have him and his associate Lei Yu show us around and tell us the story behind one of the most exciting archaeological finds of the 20th century.

After a tour of the museum—containing most of the masterpieces recovered during excavations in the 1980s, which will be seen in the ROM's show—we stepped outside, where the museum's grounds give way onto the northeast corner of the archaeological site itself. Dating to between 4800 and 3000 years ago and covering 3.5 square kilometres (1.4 square miles) of land, Sanxingdui is the largest site linked to ancient civilizations ever found in the Sichuan basin. It encompasses several modern inhabited villages, including Yueliangwan and Sanxingdui village, and expanses of cultivated lands in between. We were thrilled to be seeing it for ourselves.

A shy, serious scholar in his early 40s, Mr. Chen ushered Mr. Lei, Klaas, and me into his car to take us to a courtyard complex in the village of Yueliangwan a few kilometres southwest of the museum, where we knocked at the door of a farmhouse. A bright-eyed man, looking younger than his 60-odd years, greeted us, his curious grandchildren clustered around. This was the great grandson of Yan Daocheng. No doubt accustomed to this type of visit, Mr. Yan graciously led us through the aging house complex, where he lives with three generations of his family, and out to the backyard.

"Here was outside our old house then," said Mr. Yan in the local Sichuan dialect (which Klaas and I could fairly easily understand), pointing around the yard. We were standing in the place where it all began. Mr. Yan told us his great-grandfather's story, proudly showing off a faded black-and-white photo; in it Yan Daocheng is holding a large jade blade while his son (Mr. Yan's grandfather) stands beside him. I recognized the image, photographed at the ceremony of donation, from similar ones we had seen in the museum.

Mr. Yan confided that a couple of years after the family had unearthed the curious jade ritual objects from their yard—and nothing bad had happened—they could no longer resist the temptation to show off their find. The family alerted the local authorities (after selling a few of the jades to antique dealers, some of which may well end up in Western museums some day).

This sparked a small excavation at Yueliangwan village in 1934 by the Chinese Western University Museum (today the Sichuan University Museum), led by a Canadian-born American professor, David Graham. What the team unearthed instantly caught the attention of world scholars: they recognized that these items were unlike anything seen before. But almost 50 years would go by before a full-scale archaeological investigation could be undertaken.

Finally, in 1980, once China had recovered from decades of socio-economic turbulence, the serious digging began. Within a few years, archaeologists made a series of stunning discoveries. The batch of a few hundred jade and ceramic pieces uncovered by the Yan family was just the tip of the iceberg: the size of the Sanxingdui site and the richness of the cultural deposits

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were far beyond anyone's imagination. Thousands of artifacts, dozens of house structures, city walls, and of course the two sacrificial pits filled with amazing gold and bronze items were uncovered.

As we said goodbye to Mr. Yan, we wrapped up against the wind for the few minutes' walk to examine a part of the city wall that encloses Sanxingdui. First identified in 1989, the wall marked the site as a large Bronze-Age urban settlement. Finding the wall led archaeologists to realize that the individual discoveries made up until that point were all within the walls, components of a single city ruin.

Today, only parts of the Sanxingdui walls—measuring about 40 metres (131 feet) wide at the base and 20 metres (65 feet) at the top—remain. To the north, there was no sign of walls. Instead, the Yazi (Duck) River may have served as an ideal natural boundary, and probably also as a defensive feature. A few preserved inner walls divided the city into sections.

Judging from cultural materials recovered at the site, between 4800 and 4100 years ago (2800–2100 BC) Sanxingdui was a small settlement occupying the north-central part of the site. Here, in the small groups of houses, lived a people who used stone and pottery technology during Sichuan's late Neolithic era.

Then, around 1800 BC, the city wall was built. Between 3800 and 3250 years ago (1800–1250 BC), the population at Sanxingdui increased rapidly, forming a Bronze-Age urban centre, the earliest one known in southwestern China. Inside the city walls bronze foundries were discovered; bronze technology seized power, who saw the objects as bringing bad luck, or that the objects were destroyed by foreign invaders. Mr. Chen and his colleagues also disagree with this logic, arguing that although it may explain why the objects were broken in pieces, it overlooks the fact that the two pits do not date to the same time period, but about 100 years apart. Unless history repeated itself, this explanation remains unconvincing.

A third suggestion is that the pits served a hoard function since other hoards containing large numbers of ritual jade objects have been found in the area. Again, if these objects were stored to protect them from some kind of disaster, then why were they smashed?

"We insist that these hoards served as sacrificial pits for religious ceremonies," Mr. Chen maintains. It's clear that both pits served the same function, and my own research confirms that Chen's is the most widely accepted explanation. It is plausible to assume that the objects from the pits—bronze sculptures, bronze masks, bronze models of trees, temples and altars, ritual vessels, jade ritual items, geometric wall decorations for ritual structures, decorative hangings, and ornaments—must have belonged to temples practising unknown local religions.

The enigmatic figurines and masks appear to be religious in nature. Sculptures of human figures and heads, which likely sat on wooden posts, and human masks, which may have adhered to wood-carved figures, were probably from a temple setting, possibly portraits of religious leaders who directed the assembly for ceremonies. The three large humanoid masks with protruding pupils, floppy ears, and periscope-like "trunk" above the nose have been suggested by some to represent gods wor-

CHEN SHEN, ROM

Top: The ROM's Klaas Ruitenbeek (right) visits Yan Daocheng's great grandsons. Mr. Yan was the first to discover the secrets of Sanxingdui. **Middle & Bottom:** One of the man-made mounds for which Sanxingdui is named. **Right (top):** Statue of a standing figure, in bronze, from pit #2 is thought to represent a king or religious leader. **Right (bottom):** Map of the Sanxingdui site.

nology may have travelled to Sanxingdui from central China. Also at this time, large palaces, temples, and workshops first began to appear in the western Sichuan Basin at Sanxingdui.

Some scholars suggest that the raised terraces in the area near Yueliangwan may have been foundations for palaces or royal structures, but systematic surveys have yet to be carried out. It is equally possible that the city's royal temples and ceremonial structures were located in the city's southern area, near three unusual mounds that occupied the area until the 1980s.

The name Sanxingdui, literally "Three Star Mounds" in Chinese, refers to these three man-made mounds. Only half of one mound remains preserved today. Their function is not clear, but they are thought to have served as altars for ritual ceremonies. The two sacrificial pits filled with a rich store of finely crafted bronze, jade, and gold were also found nearby, supporting the notion that this area's function was ceremonial.

Within the city walls, archaeologists have recovered dozens of house remains that would have been part of the large settlement during the Bronze-Age occupation. Made of bamboo and wooden posts, the houses had earthen walls and straw roofs; some had raised floors. Some burial sites, too, were found, apparently of local residents, but the largest concentration of graves was outside the city walls. Also in the northern area, bronze foundries and stone workshops were clearly identifiable.

"All of this," says Mr. Chen, "tells us that Sanxingdui was undoubtedly a religious and political centre in southwestern China 3200 years ago." This was surprising news to archaeologists: ancient Sichuan had always been considered a cultural backwater—an area that was greatly under the shadow of the dominant culture of China's Central Plain until the first millennium AD. Scholars had long believed that Chinese civilization at this time existed only in the Middle Valley of the Yellow River. The idea took root during a search for the origins of Chinese civilization in the 1920s, when a late Shang capital called *Yinxu* was excavated at Anyang in China's northern Henan province. The notion persisted for decades, reinforced by finds of bronze art from Anyang and other Shang sites in central China, which suggested an advanced and complex state.

"But that view has changed," Mr. Chen is quick to point out. "We now recognize that any study of Chinese civilization would not be complete without mention of the more recent revelations in Sichuan. Sanxingdui represents as highly developed and complex a society as its contemporary, the Shang dynasty, especially the items found in the two ceremonial pits."

Back at Yueliangwan, we got into the car again for the drive to the site's southern area, called Sanxingdui village. From there, we walked to where the pits—and nearby mounds—had been discovered. The bronze and gold contents unearthed from these mysterious pits are as magnificent as they are puzzling. Walking across the calm land, green with cultivated canola not yet in flower, we found it hard to imagine the field as the very site that had astonished hundreds of witnesses when the pits were unearthed 14 years before.

No doubt Mr. Chen has told the story about the pits' discovery hundreds of times—his calm voice betrayed little of the elation he must have felt at the time—but the tale is dramatic. The morning of July 18, 1986, Mr. Chen and his colleagues were carrying out their daily field investigations when a messenger from a local brick-making factory came running and shouting onto the site; workers removing earth with a bulldozer had uncovered a number of jade pieces and stonewares.

Immediately, archaeologists checked into it, and quickly determined that the find was a "burial" or "pit." Five days later, once they had carefully removed a thick layer of tamped earth at the top of the pit to expose an earthen ramp leading down from the top—both signs that what was within had been

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shipped by the Sanxingdui people.

Vessels and jade objects that have no evident utilitarian purpose appear to be ritual utensils and offerings to gods or ancestors. All the recovered jade objects, mostly blades, were for ritual purposes. They are depicted as sacred objects held in the hands on one of the large jades and on two small bronze temple models. There is also a bronze figure kneeling and holding a blade ritualistically. The real temples might well have been decorated with hangings and ornaments, as well as geometric wall adornments. Some scholars have interpreted the forms and designs of the sacred objects to suggest that Sanxingdui religion may have involved bird veneration and solar-god worship. Whether the rituals related to war, the climate, harvesting, or ancestral worship is not clear.

But the question remains: why would people destroy ritual items after a ceremony? Did the burning, breaking, and burying represent customs of unknown rites, or something else? Scholars may have to wait for further archaeological discoveries before they can know for sure.

And this may happen relatively soon. Just last year yet another site, Jinsha, was found at Chengdu, revealing jade, gold, bronze, and pottery similar in style but even more fine than those from Sanxingdui. This new discovery should help to clarify the astonishing Bronze-Age history of the Chengdu area.

CHEN SHEN, ROM

KLAAS RUITENBEEK, ROM

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Top: Excavations at the Sanxingdui site continue today. **Middle:** The ROM's Chen Shen (left) with Sanxingdui archaeologist Lei Yu, at the Sanxingdui Archaeological Work Station. **Bottom:** This bronze figure holding a *zhang*-blade, from Sanxingdui pit #2, indicates the ceremonial use of blades found in the pit. **Opposite page:** A bronze *lei*, or ritual vessel, ca. 1200 BC, from Sanxingdui pit #2.

intentionally hidden—layers of exotic objects began to emerge. Many of the bronze artifacts were unlike anything that had been recovered elsewhere on the site. News spread quickly among the local villages and soon dozens of onlookers crowded around.

As precious objects began to emerge, the archaeologists became more excited—but also more concerned about looting. They decided to take shifts working day and night to excavate the 1.5 metre- (5-foot-) deep pit. About 3 am on July 27, they suddenly came upon a magnificent 1.42-metre- (4½-foot) long golden tube carved with designs and used for wrapping a wooden pole. "I immediately realized this was a gold masterpiece," said Mr. Chen, "but for security reasons I had to tell the local workers it was a piece of copper."

The next day, with security guards in place, archaeologists continued to recover objects. Enigmatic bronze figurines and masks of a type not seen anywhere else on the site were still emerging. The excavation lasted two and a half more weeks. It was the kind of discovery that every archaeologist dreams about but that only a lucky few will ever encounter.

On August 14, when Mr. Chen and his team at last backfilled the pit, packed up the objects, and were ready to leave, there was more astonishing news: bronze figures similar to those just unearthed had been dug up by the same brick-workers who had moved their operations when the first pit was discovered. The contents of pit number two were even more eye-popping.

Found about 30 metres away, the second pit was similar in size but slightly longer and narrower than the first one. Pit number two yielded some 1300 objects, about triple the number found in pit number one, plus 67 elephant tusks and more than 4000 seashells. The second pit also contained perhaps the most distinctive object of all—a 3-metre- (10-foot-) tall bronze standing figurine of a man on a pedestal with his arms crossed in front, possibly representing a king or religious leader. (The golden tube from pit number one also undoubtedly symbolizes the power of authority.) Other items in pit number two were a tree made entirely of bronze, standing about 4 metres (13 feet) high, bronze figures of human heads—four of which were inlaid with gold, and others painted—and masks, some as large as coffee tables, representing faces of humans, human-like creatures, and completely unknown beasts.

Even the arrangement of items found in the pits is extraordinary. Many of the objects had clearly been intentionally smashed to pieces and burned before being put into the pits. None of the bronze objects was intact, although all the pieces were found. Scholars are still unclear as to why this is the case (see "Smash and Burn", page 15). As well, about 3 cubic metres (106 cubic feet) of burned animal bones were identified from pit number one. Judging from the soil deposits, excavators believe that groups of objects were buried in pit number one in sequence: stone and gold objects first, then the bronze heads, masks, and ritual vessels. Next, the burned animal bone debris with small jade ornaments, bronze weapons, and ceramic objects. Last came the large ritual jade objects and possibly the elephant tusks.

Evidence of strategic placement was even more noticeable in pit number two, where three distinct layers occurred. The bottom layer comprised a large number of small bronze ornaments and decorations for the bronze trees, and a number of jade ritual objects. The middle layer contained the standing human figurine broken in half, large bronze heads with gold face masks, large masks, large bronze trees, and other ritual objects, all broken in pieces. The top layer consisted entirely of 67 elephant tusks.

Along with their hoard of treasure, the mysterious pits, it seems, also buried the glory of Sanxingdui as a cultural centre: the site appears to have been abandoned suddenly between the 12th and 11th centuries BC. Afterwards, the centre of the state moved 41 km south to present-day Chengdu

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city, now capital of Sichuan, where similar pottery dated to a later time (1200–800 BC) has been found, so continuing the time line.

As Chen De'an and his colleague walked us to the final stop on the field trip, they assured us that they continue to dig for answers. In the two-storey red-brick Sanxingdui Archaeological Work Station, logistical and research facilities are provided for the ongoing fieldwork at the site. Here, shelves full of artifacts stretch from wall to wall, and a group of researchers was busy restoring vessels and sketching them as permanent records. We met these diligent and talented young researchers who are studying the hundreds of thousands of artifacts recovered from the Sanxingdui site over the years. Most of the scholars working here, including Mr. Chen himself, have homes in Chengdu city, but return to visit their families only once a week. A year later, when I returned to Sanxingdui, I saw the same group of people, this time excavating in a field, their dedication to solving the continuously unfolding mysteries of ancient Sichuan evident.

Precipitated by farmer Yan's need for a water ditch, the discovery of Sanxingdui, with its astonishing sacrificial pits, city ruin, sophisticated bronze-casting techniques, and unique art forms, has revealed that a local culture and a highly developed state existed in Sichuan more than 3000 years ago. Where this lost civilization came from, however, and how it disappeared are questions yet to be answered.

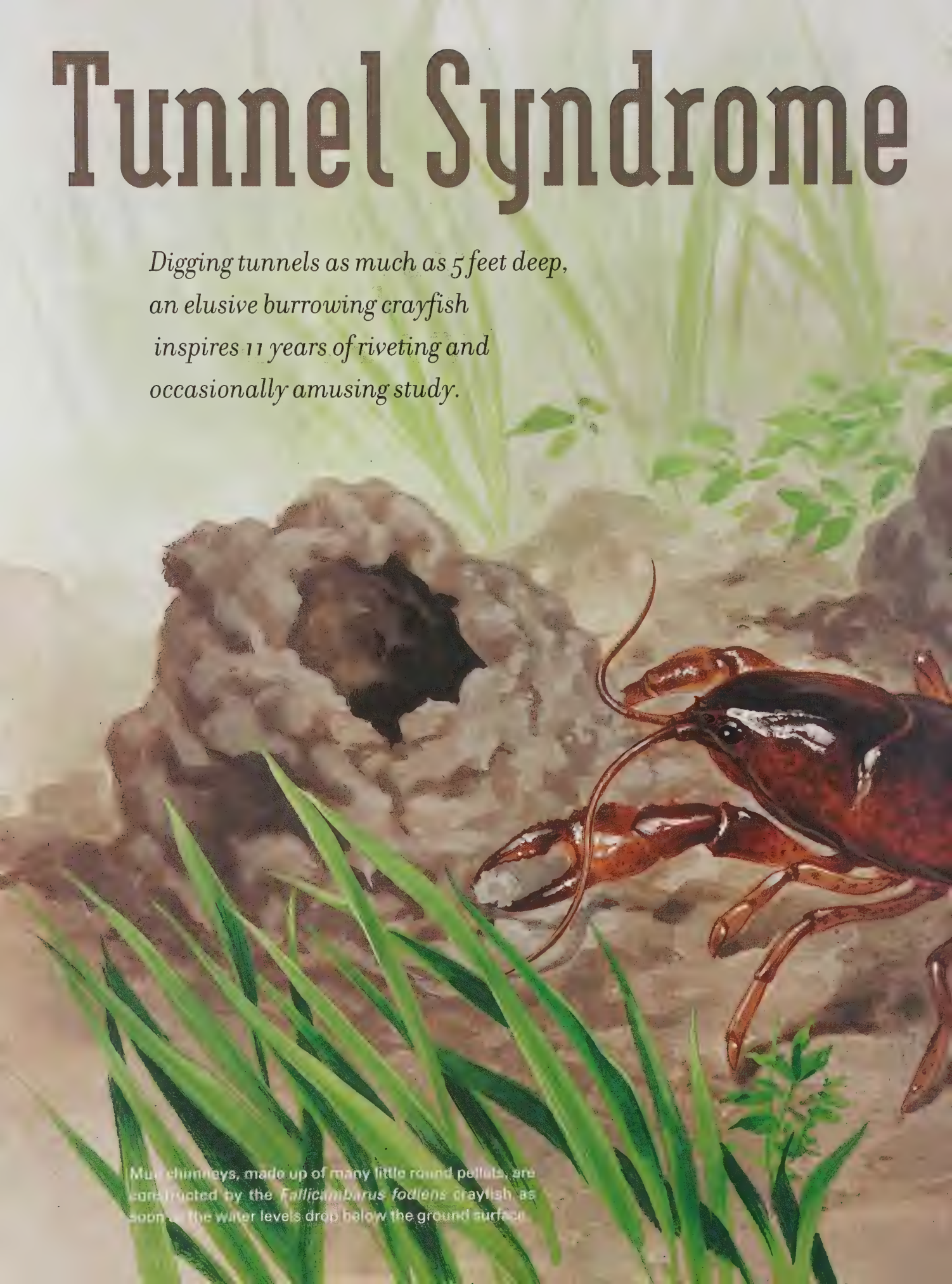
Does the Shu Theory Fit?

Who were the mysterious people who built the Bronze-Age city of Sanxingdui, establishing a sophisticated state in Sichuan, China, between the 19th and 13th centuries BC? Some scripts carved on 13th century BC oracle bones—the first writing system in China—found at Anyang in China's north-central Henan province refer tangentially to a "Shu" state and "Shu" people. The texts clearly indicate that the Shu had a collateral relationship with the central Chinese states, but it is uncertain whether the Shu were an ancient Sichuan people. Until the discovery of the Sanxingdui site, researchers had no direct proof that another culture existed. Because the dates fit, and because no other possible Shu sites have ever been found, it is tempting to associate Sanxingdui with the Shu people. Is the Sanxingdui site indeed a city of the Shu culture? Archaeologists and historians are still working to find out.

The exhibition *Treasures from a Lost Civilization: Ancient Chinese Art from Sichuan*, sponsored by AIC Group of Funds, opens at the ROM on 3 August and runs to 10 November 2002.

Tunnel Syndrome

Digging tunnels as much as 5 feet deep, an elusive burrowing crayfish inspires 11 years of riveting and occasionally amusing study.



Mud chimneys, made up of many little round pellets, are constructed by the *Fallicambarus fodiens* crayfish as soon as the water levels drop below the ground surface.

It was a late afternoon in May 1991 when the Zoology Department's blue van came to a stop, leaning at a perilous angle over a narrow muddy ditch, squeezed between a nameless concession road and an abandoned corn field in the countryside just north of Scarborough, Ontario. It must have seemed an unlikely destination; some of the few passing motorists stopped to ask if we needed assistance. But I and my trusted field research assistant, Erin Uiska, knew we were in the right place. We could see the telltale elegant mud chimneys among the grasses and weeds lining the sides of the drainage ditch. After several weeks spent searching through various swamps across southern Ontario, where we found nothing but mosquitoes and leeches, we had at last discovered what we were looking for—reliable evidence of the elusive burrowing crayfish species *Fallicambarus fodiens*.

Unlike this expedition, most of my fieldwork has taken place around spectacular waterfalls, postcard-perfect lakes in

by Radu Cornel Guiaşu

illustrations by Olena Kassien / Sharpshooters
based on photographs by the author

the Algonquin Provincial Park region, attractive fast-flowing streams, and other beautiful protected areas in southern and central Ontario. That work, which focused on the northern surface-water crayfishes of the genus *Cambarus*, provided many opportunities for walks through the forest, wildlife photography, and sightseeing. In contrast, the search for the burrowing *Fallicambarus fodiens*, a semi-terrestrial species, was accompanied by no such extra benefits. Because these small, brown crayfish are largely subterranean, they are difficult to find, and the few sites they do inhabit are somewhat less than picturesque. Still, my growing curiosity about these little-known crayfish and how they fit into the diversity of Ontario crayfishes led me to persevere.

In the decade since my initial discovery of *Fallicambarus fodiens* at that isolated ditch, I have had the opportunity to collect many live specimens and study their behaviour and ecology. Unlike *Procambarus clarkii*, the ubiquitous red swamp crayfish of Louisiana, which is widely used in research and teaching laboratories, the *Cambarus* and *Fallicambarus* species that I have continued to study are not available from biological supply companies. I have had to collect my own specimens, returning them, at the end of my studies, to their natural habitat. The burrowing crayfish research was part of a larger project designed to analyze and compare the aggressive behaviours, social interactions, and life histories of several northern crayfish species living in different habitats.

Since these crayfish are rarely abundant, I did not want to collect too many from any one location. As I ventured farther and farther from the university campus during the field studies, I also gleaned valuable direct information about the habitat requirements, ecology, and distributions of these species, which has led to more projects on identifying and conserving the more vulnerable crayfish populations.

The eastern half of North America is home to more than 75 percent of the world's 500 or so crayfish species. About one-fifth of North America's crayfishes are semi-terrestrial burrowers, most of which live in the southeastern United States. But three of these burrowing species, *Fallicambarus fodiens*, *Cambarus diogenes*, and *Orconectes immunis*, can also be found in southern Ontario, which shelters more crayfish species than any other region in Canada.

Unlike the vast majority of crayfishes, which inhabit rivers, streams, and lakes, semi-terrestrial burrowing crayfishes such as *Fallicambarus fodiens* can sometimes be found in habitats far removed from any permanent surface waters. When temporary pools dry up, usually at the end of spring, these resourceful crustaceans dig vertical tunnels through the mud, following the receding water table underground. Their tunnels can be more than 1.5 meters (4.9 feet) deep and some contain several rest stations along the way.

Special adaptations allow these burrowing crayfish to survive in waters with very low oxygen content, or out of water altogether for much longer periods than crayfish species that live in rivers and streams. *Cambarus bartonii* and *Cambarus robustus*, for example, two Ontario crayfish species inhabiting cool, fast-flowing rivers rich in oxygen, cannot usually survive out of water for more than 20 to 30 minutes, whereas burrowing *Fallicambarus fodiens* adults can live for several weeks out of water if the air humidity is high enough. Burrowing crayfish are able to extract and use oxygen from the air much more efficiently than their river and lake relatives.

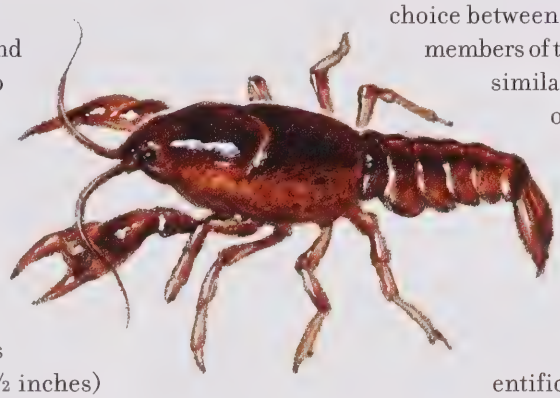
This ability is particularly useful at times when the water table retreats far below the earth's surface, where the semi-terrestrial crayfish, despite their remarkable digging abilities, cannot follow. The few biologists who have attempted to collect burrowing crayfish agree that the task becomes nearly impossible once the water level drops much below ground. During the dry summer months, burrowing crayfish may emerge from their tunnels only on very humid nights, if at all. If drier conditions persist, *Fallicambarus fodiens* crayfish plug their chimney openings with small mud caps

Opposite page, top: *Fallicambarus fodiens*. In contrast to the river species, this small burrowing crayfish has a more cylindrical body, which allows it to easily slide down the burrow when faced with a threat. Burrowing crayfish cannot stay in place very well in faster waters, possibly because of an inability to properly grip the river floor. **Opposite page, bottom:** *Cambarus robustus*, a large crayfish found in rivers in southern and central Ontario, has a flattened body and a great capacity to walk along the bottom of fast-flowing waters without being swept downstream. Such a body type is typical for crayfish species living in streams.

The current distribution of *Fallicambarus fodiens* in Ontario, the only Canadian province where this species is found.

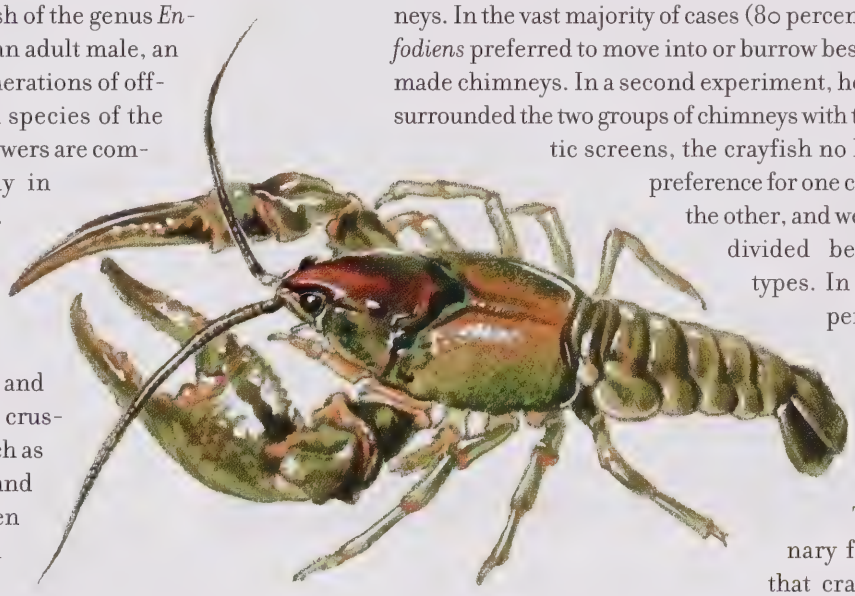
to keep moisture in, and retreat to the bottom of their burrows, where they have been known to stay for up to 250 consecutive days. Burrows, then, provide not only shelter from predators, but also a fairly cozy environment where fluctuations in temperature and humidity are minimized.

As crayfish dig and maintain their burrows, they constantly excavate mud, manipulating it with their claws, front walking legs, and mouthparts. The resulting small balls of mud are then rolled out the top of the burrow and incorporated into the distinctive chimney which sits above each burrow entrance. Adults and juveniles of both sexes are able to dig burrows and construct mud chimneys. The size of a burrow's chimney is usually a good indicator of the size of crayfish to be found below. Adults, whose total body length is about 6 to 7 cm (2 1/3 to 2 3/4 inches), build chimneys up to 15 cm (5 3/4 inches) high, whereas the juveniles at 3 to 4 cm (1 1/8 to 1 1/2 inches) long, build chimneys only 5 cm (2 inches) high.



Unlike the more aggressive and solitary river and lake crayfish species, burrowing crayfish seem to be able to coexist peacefully within their subterranean homes. Burrow-sharing allows the adults to mate and the juveniles to grow in a relatively safe and sheltered environment. The same behaviour is evident in other semi-terrestrial crayfish; the burrows of Australian crayfish of the genus *Engaeus*, for example, contain an adult male, an adult female, and several generations of offspring. Among the crayfish species of the Southern Hemisphere, burrowers are common and are found mainly in Australia and South America.

The tunnels and chambers dug by crayfish sometimes shelter other animals as well. Invertebrates such as nematodes (roundworms) and amphipods (a group of small crustaceans), and vertebrates such as leopard frogs, salamanders, and even garter snakes have been found taking refuge in crayfish burrows—usually ones that have been abandoned. In nearby Ohio, a Massasauga rattlesnake, a species endangered in Ontario, was discovered hibernating in a burrow of *Fallicambarus fodiens*. The coexistence of the two has not been documented in Ontario, but *Fallicambarus fodiens* has also been known to share its home with salamanders. Crayfish burrows can provide vital winter accommodation for vulnerable species, such as amphibians, whose recent decline in several regions of the world, including Ontario, is due partly to habitat loss.



Something that attracted my attention was that the mud chimneys built by *Fallicambarus fodiens* tend to be grouped closely together in small areas, even though other seemingly suitable habitat is available nearby. Curious to find out more about the habitat selection and chimney recognition behaviours of these crayfish, I worked in the lab with Dr. David Dunham of the University of Toronto, researcher David Punzalan, and several students.

In a series of experiments, we presented crayfish with a choice between a group of chimneys built by other members of their own species and a cluster of very similar-looking ones that we had made ourselves. Chimney building did not come easily to us at first, and we spent hours rolling little balls of mud and making them fit into stable, cylindrical structures comparable to the ones the crayfish make. It felt more like an introductory pottery class than a scientific experiment. Before we were ready for the experimental trials, the lab was covered with mud, but in the end we were pleased with our work and felt we had done a reasonably good job of duplicating the crayfish's handiwork. The two sets of chimneys looked identical to us.

Not so to the crayfish. Unlike several undergraduate students presented with the same challenge, the crayfish were consistently able to distinguish between the two types of chimneys. In the vast majority of cases (80 percent), *Fallicambarus fodiens* preferred to move into or burrow beside the crayfish-made chimneys. In a second experiment, however, when we surrounded the two groups of chimneys with transparent plastic screens, the crayfish no longer showed a preference for one chimney type over the other, and were almost evenly divided between the two types. In this second experiment, the crayfish could see the chimneys, but could no longer touch or smell them. These preliminary findings suggest that crayfish use visual cues to identify clusters of chimneys from a distance, and chemical and tactile cues to discriminate between the different types of chimneys at close range.

It appears, then, that the crayfish chimneys function as signposts, attracting new burrowing crayfish to the area and leading to the formation of larger colonies. The building of structures that play a role in communication is not uncommon among semi-terrestrial crustaceans. In several species of fiddler crabs (genus *Uca*), for instance, males build mud

pillars important in attracting females to their burrows. Male ghost crabs of the species *Ocypode saratan* build sand pyramids to keep other males away and to attract females to their special spiral burrows used solely for mating. In another ghost crab species, *Ilyoplax pingi*, both males and females build mounds of mud that serve to warn other crabs away from the builders' burrows.

Understanding crayfish behaviour is important to conservation efforts. But tracking the changing distribution of these crayfish in Ontario is critical to understanding how well they are doing as a species. Southern Ontario, the only region of Canada in which *Fallicambarus fodiens* is found, represents the northern edge of this species' North American distribution. The Canadian Shield forms a natural barrier, preventing the crayfish, which need clay soils for burrowing, from expanding their Ontario range northward.

Despite its rather fragile appearance, *Fallicambarus fodiens* seems to tolerate winters in Ontario and the frequently frozen soil conditions quite well. This sets it apart from most other burrowing crayfish species, which are restricted to milder southern regions. Although *Fallicambarus fodiens* is still fairly widespread in the United States, found mainly along the Mississippi River valley and within the Atlantic coastal plain from Maryland to South Carolina, its Ontario range covers only about 25,000 square km (10,000 square miles), an area stretching from Windsor to the southern shore of Lake Simcoe. Within this area, *Fallicambarus fodiens* is restricted to a few isolated patches of suitable wetland habitat and some drainage ditches scattered over an area representing little more than 2 percent of the province, just 0.25 percent of Canada's landmass.

Until I first saw the freshly built mud chimneys in the field on that late spring day in 1991, I had begun to think that the only *Fallicambarus fodiens* left in Ontario were confined to the old alcohol-filled jars I had examined in the invertebrate collections of the ROM and at the Canadian Museum of Nature.

These collections offered a valuable historical record of the Ontario distribution of *Fallicambarus fodiens* over several decades. The ROM's historical crayfish collection contained specimens of *Fallicambarus fodiens* collected during each decade between 1919 and 1966, at various locations within the province.

During this first phase of my research, I was alone for many hours in the large collection room, a very dark and quiet place filled with oversized floor-to-ceiling grey metal shelves and infused with faint alcohol and formaldehyde fumes—the perfect setting for a thriller, though nothing frightening ever did happen. I examined all the preserved crayfish, checking that they had been correctly identified and noting the exact locations and habitats where the specimens had been collected.

With my annotated list of old distribution records for *Fallicambarus fodiens* in hand, I set out in search of this relatively rare crayfish in the field to update its distribution and status in Ontario. Dr. David Barr—a former curator in the ROM's Department of Invertebrate Zoology, and a co-author (with Denton Crocker) of the most comprehensive survey of the Ontario crayfishes published to date—collaborated with me in putting the distribution maps together. Then I was able to compare my new field findings with the old distribution records, and it became clear that the Ontario range of *Fallicambarus fodiens* is gradually diminishing.

Several of the Greater Toronto Area locations that supported burrowing crayfish colonies in the 1960s have since been developed for industrial or commercial purposes. Of even greater concern, more than 70 percent of the wetlands originally found in southern Ontario have been severely altered or destroyed over the last 200 years or so, drastically reducing the available habitat for all local wetland fauna, including the burrowing crayfish.

> The burrowing crayfish are an integral and unique part of a complete southern Ontario wetland ecosystem. The gradual disappearance of these burrowers would undoubtedly affect a variety of other local species, and further disrupt the delicate balance within some of our already fragile wetland habitats.

Wetlands, which include swamps, marshes, and bogs, provide shelter and food for more than one-third of North America's endangered species. They act as traps for aquatic and soil pollutants from surrounding areas, and they help to minimize flooding and erosion. Yet throughout the world, wetland ecosystems are endangered. An awareness of the significance and vulnerability of these habitats is especially important in Canada, which contains about one quarter of the world's remaining wetlands.

Given its relatively small initial Canadian range, and the recent losses of suitable habitats, *Fallicambarus fodiens* can now be considered vulnerable, possibly even threatened, in Canada. Because of the ongoing destruction of habitat, more local colonies are sure to disappear. As a result of human activities, this species has recently vanished from certain regions of Indiana and Arkansas, as well.

All hope is not lost, however. Within the Greater Toronto Area, one encouraging development was the creation in 1990 of Rouge Park, running northward from Lake Ontario through the valley of the Rouge River. The park was expanded in 1999. Not only does the park provide great hiking and bird-watching opportunities for locals, but it also preserves vital habitat for hundreds of species of plants and birds, as well as many fish, amphibians, reptiles, and mammals. An additional benefit—likely not foreseen by the planners—is that the new urban park, one of the largest of its kind in North America, gives shelter to a few small but enduring colonies of *Fallicambarus fodiens* crayfish.

Within the park, natural habitat restoration is underway, albeit on a small scale, as gravel pits are slowly filling with water to become small ponds, and abandoned farm fields are gradually being transformed back into forested wetlands. This small but promising step toward wetland restoration near the northern shore of Lake Ontario ensures the long-term survival of at least some of the local burrowing crayfish populations, and may allow for their future expansion into new suitable areas.

Still, destruction of wetlands is proceeding at a more rapid pace than restoration projects throughout the range of *Fallicambarus fodiens*. The danger remains that current northern populations of this species could become trapped in tiny pockets of suitable habitat, becoming increasingly isolated from one another. Eventually, this can lead to a loss of genetic diversity within the remote colonies, making them more vulnerable to extinction.

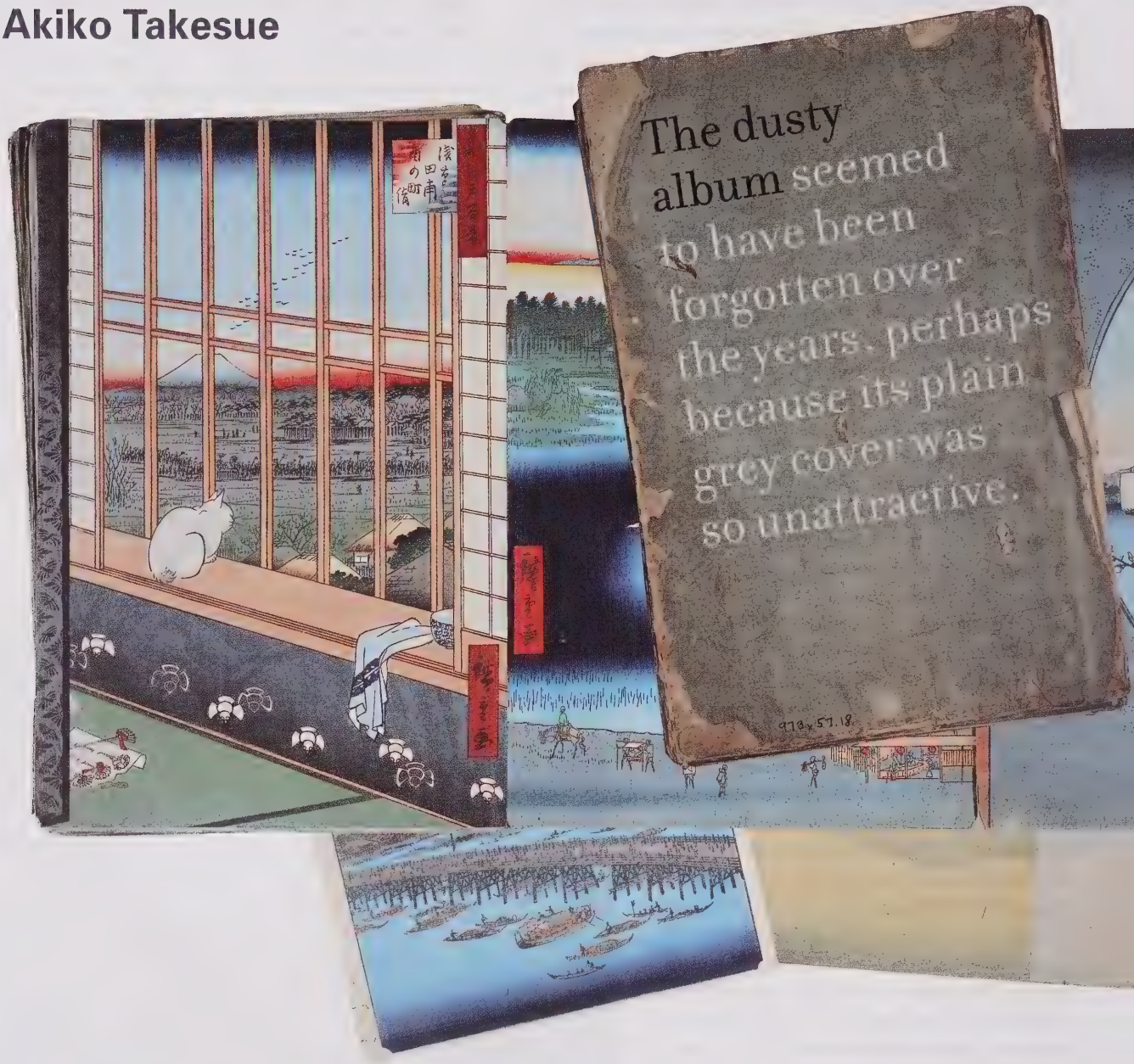
The burrowing crayfish are an integral and unique part of a complete southern Ontario wetland ecosystem. We are just beginning to uncover their subtle impact on their surroundings and their complex relationships with other species, as potential prey, predators, and providers of shelter. The gradual disappearance of these burrowers would undoubtedly affect a variety of other local species, and further disrupt the delicate balance within some of our already fragile wetland habitats.

To attentive human observers, the small chimneys built by the inconspicuous *Fallicambarus fodiens* crayfish discreetly advertise their presence, and thus can help us identify and preserve more of the vital habitat around their burrows. By becoming aware of the semi-terrestrial crayfish living in and near our cities and by learning about their biology and distribution we will be in a better position to respect the small spaces they require and to encourage their continued existence in southern Ontario.

A muddy drainage ditch in the early spring. Juveniles can be found in the temporary water until the end of spring, when they start to dig their own burrows.

A forgotten album of celebrated Japanes

By Akiko Takesue



Famous First

Inside, was an amazing find

—most of the print series *One Hundred Famous Views of Edo* by Utagawa Hiroshige (1797–1858), the great Japanese master of landscape print. I could scarcely believe the discovery, made while I researched the ROM's collection of some 2000 *ukiyo-e* prints—woodblock prints from Edo-period Japan (1603–1868).

rints holds a valuable surprise.

Photography by Brian Boyle

Impressions

Hiroshige is probably the most famous Japanese artist known in the West, where his lyrical and novel interpretations of Japanese landscape have garnered acclaim since they first appeared in 1856. Van Gogh once spent his last penny to purchase several of Hiroshige's prints and then, painting in oil, he copied three of them, one an image from the *Famous Views* series.

The ROM's album contains 108 of the 120

Special Effects in *Ukiyo-e* Prints

Gradations (*bokashi*)

Several methods were used to produce gradation effects:

- "gradation by wipe (*fuki-bokashi*)," in which a printer wiped the desired area of woodblock with a half-wet piece of cloth before applying pigment
- "straight-line gradation (*ichi-monji-bokashi*)," a kind of "wiping gradation" in which a gradation appeared in a horizontal straight line, either downward from the top of the sky or upward from the bottom of the ground or water
- "free-hand gradation (*atenashi-bokashi*)," also a kind of "wiping gradation" in which the position and the shape of the gradation were only roughly decided by the artist, so that the result greatly depended on the printer's hand. This technique was often applied to a blurred cloud or a streak of mist
- "gradation by block (*ita-bokashi*)," in which the desired area, or block, was sloped by polishing it first with special leaves, so that when the pigment was applied, it was uneven. (This technique was not used in the *Famous Views* series.)

prints in the series, first produced around 1856–1858. Bound in the format of a folded book, each print is about 33 x 21.5 cm (just over 12 x 8 inches). While *ukiyo-e* prints were most often sold individually in separate sheets, mounting a series into an album like the ROM's was not unusual. In Edo-period Japan, it was common practice to paste prints together edge-to-edge to form a folded album. While many of the prints in the album have suffered worm damage, the colours remain remarkably vivid. But, most surprising, close examination reveals that this forgotten volume—without a clear record of acquisition or provenance—is almost certainly a "first state," or first edition.

"First state," "second state," and "later impression" are Western terms that refer to different editions of a print. Unlike paintings, *ukiyo-e* prints were produced in fairly large quantities as commercial art, making them affordable for common people in feudal Edo-period Japan. The prints were made as posters of famous places, advertisements for theatre performances, and idol portraits of popular actors or courtesans.

Generally, first state refers to the first 200 impressions of an image. What's important about distinguishing first-state from later prints is the higher printing quality they represent. Under the very careful supervision of the artist, the first 200 prints were made from an unworn woodblock. In printing later impressions, the block often became worn out, so that fine lines blurred and colours appeared

I could easily see that the print from the album conveys a subtler and more delicate atmosphere.

less fresh than in earlier impressions. And without the artist's supervision, printers tended to alter or omit complicated colouring and printing techniques. This is why it's impossible to fully appreciate an artist's aims and skills in depicting a subject without looking at first states.

Some researchers argue that the preference for one or another variant—or state—of the same image is largely a question of taste. *Ukiyo-e* prints have been perennial favourites worldwide among art collectors for more than a century, however, and there is no getting around the fact that a huge gap in market value exists between first and later impressions of these prints in today's art market. Hiroshige's *One Hundred Famous Views of Edo* series demonstrates why this is so, showing the clear difference in quality between first and later impressions.

The series, the largest single-sheet landscape series in the history of *ukiyo-e*, portrays the city of Edo (modern-day Tokyo), showing famous places viewed through the artist's unique perspective. In some images, Hiroshige boldly enlarged motifs in the foreground against a distant background. This striking feature of composition helps make the series outstanding, as do the elaborate colouring and variety of printing techniques. For almost 50 years, *One Hundred Famous Views of Edo* was so popular that large numbers of later impressions were produced repeatedly, long after the Edo period ended in 1868, right up until about 1900.

Looking at these prints, it's easy to see that many print techniques that were exquisitely applied in the first state, were more or less abandoned or altered in later impressions. These include gradation (*bokashi*), blind printing—imprinting a colourless pattern into the paper's surface to give it texture or volume—and the use of mica, which gives a subtle glittering effect when turned in the light (see "Special Effects in *Ukiyo-e* Prints").

In his book *Hiroshige*, *ukiyo-e* authority Suzuki Jûzô describes in detail the technical features of individual prints from the *Famous Views* series that can be observed only in the first state. After carefully comparing the ROM's album with Suzuki's descriptions, I realized that the album is almost certainly a first state.

The album's print titled "*Ryôgoku hanabi*" ("Fireworks at Ryôgoku"), for example, accurately fits Suzuki's description: "The background of fireworks is bright-

Special Effects in *Ukiyo-e* Prints

Embossing

Several techniques existed for pressing a colourless pattern into the paper surface to give it texture or volume. These included:

- "fabric-printing (*nunome-zuri*)," in which a piece of silk cloth was placed over a block, covering the desired area, and then pressed heavily;
- "blind printing (*karazuri*)," in which the desired pattern was carved into a block and then pressed into the paper without ink; and
- "*kimedashi*," a kind of blind printing accomplished by re-using the block that had been printed in black, this time without ink.

Use of mica

It has not been determined exactly how mica was applied in the Famous Views *series, but likely, powdered mica was lightly dusted onto the coloured area while the ink was still wet to give a subtle glittering effect when turned in the light.*

Opposite page: The ROM's album of Hiroshige's *One Hundred Famous Views of Edo* series contains first state prints. The print on the left, "Night View of Suruwaka Street" shows the moon in its original position. Above: A later impression of the print shows changes in many details, including a lower-placed and larger moon. On pages 28-29: Various views of the ROM album.

The Printing Process

While artists typically garnered the most recognition for their *ukiyo-e* prints, the process of print production involved several players: publishers, artists (more precisely, designers), woodblock cutters, and printers.

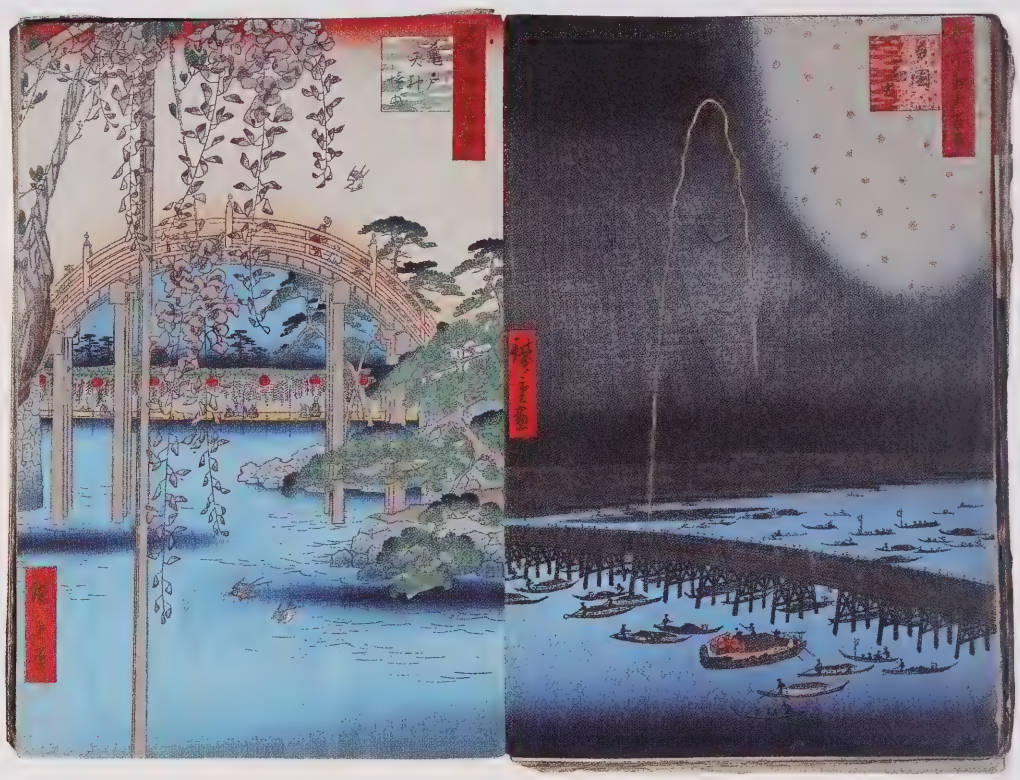
The process began when a publisher commissioned an artist to make a drawing in accordance with his idea for a new production. After the artist rendered a design, a block cutter and his workshop carved the corresponding series of woodblocks based on the artist's drawings. The number of blocks needed to produce a single image depended on the number of colours used, sometimes 10 or more.

Then, a printer and his workshop printed the woodblocks—the inks were mainly vegetable and mineral pigments—by hand onto Japanese paper. The printer followed the artist's instructions for colours and printing effects. While the artist's vision in the creation of a *ukiyo-e* print was significant, the technical skills of block cutters and printers also considerably influenced the final results.

ened with a pink gradation, and the rest of the sky is filled with indigo-grey." (Suzuki, *Hiroshige*, Nihon Keizai Shinbun, Tokyo, 1970, pp. 146–47, translated from Japanese by Takesue). Suzuki also mentions grey gradations sweeping downward from the top and upward behind the far riverbank, mica applied to the sky, and a deep-indigo gradation in the water, all of which can be seen in the print from the album. The brightened background of the fireworks was the decisive factor in determining that this print is first state. In contrast, another single print of the same image, also from the ROM's collection (opposite page), shows the background of the fireworks remaining the same light indigo-grey as the rest of the sky, and the upward gradation behind the far bank is lacking. From these omissions I can easily deduce that the single print is a later impression.

The missing detail of the light effect behind the fireworks changes the whole impression of this image. With it, the artist successfully captures the moment the fireworks have just exploded: the mood at the cheerful summer-night event is alive with excitement. Viewing the piece I can almost hear the bustle of people on the bridge and the boats. Because Hiroshige's composition is sound, the later impression still retains the spectacle of fireworks, but it lacks the expressiveness and poetic effects the artist had originally intended.

When I compared another print, this



For almost 50 years the series was so popular that large numbers of impressions were produced repeatedly.

one titled "*Saruwaka-machi yoru no kei*" ("Night View of Saruwaka Street"), to Suzuki's description, I found more evidence that the series was a first state: "The position of the moon is higher than the title cartouche and a blurred cloud by gradating effect appears under the moon," writes Suzuki. "Gradations are applied along the eaves and on paper-covered lamps; in the later impressions, the background woodblock was replaced by another in which the moon became bigger and the position lower, and most of the gradations are omitted" (Suzuki, 1970, p. 146, translated by Takesue).

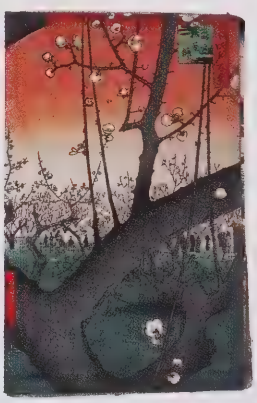
For this print, the position and size of the moon become the key identifying elements. In the print from the ROM album (page 30), the moon is placed higher than the title cartouche, which establishes that it is a first state. The single print from the ROM's collection (page 31), however, with its lower-placed and larger moon, is a later impression. As well, the blurred cloud and fine gradations appear in the print from the album, but not in the single print. I could easily see that the album's image conveys a subtler and more delicate atmosphere of the autumn night, better capturing Hiroshige's poetic touch.

Other later impressions differ in various ways: wisps of clouds whose forms were determined individually by the hand of the printer are missing, the use of gradations and mica is less extensive and more cursory, the multi-coloured effects of the title cartouches are abbreviated, and the colours are often changed. Not all these changes necessarily affect the whole mood of the image, but others, combined with the roughness caused by the worn woodblock, radically alter the image's atmosphere.

Such a fine and comprehensive set of Hiroshige's *One Hundred Famous Views of Edo* is rare in the West: only a few complete sets of the series' first state exist on this side of the world, one of them at the Brooklyn Museum in New York. Now that we've discovered that this long-forgotten ROM album contains what are almost certainly first impressions of Hiroshige's work, our conservation experts can begin the work of returning this valuable series to its original condition, ready for public display. The prints afford a precious opportunity to contemplate Hiroshige's perspective on the city where he was born and raised, and to enjoy the masterpiece that Edo townspeople treasured more than 140 years ago.

Van Gogh and *Ukiyo-e*

Vincent Van Gogh shared an admiration for Japanese art with many of his contemporary Impressionist painters, and owned a collection of more than 200 *ukiyo-e* prints. Throughout his later life they were always hung on the walls of his rooms. Van Gogh studied the prints in great detail, making almost exact copies of three of them in oil—one of which was from Hiroshige's *One Hundred Famous Views of Edo* series, "*Kameido Umeyashiki*" ("The plum tree teahouse at Kameido"), shown below. What inspired Van Gogh were the vivid clarity, the plain unmodulated colours, and the surprising compositions, influences which can be traced in his own paintings and drawings. *Ukiyo-e* prints even appear in backgrounds of the portraits he painted, as in *Portrait of Père Tanguy* (1887). To Van Gogh, Japan represented a world of peace, simplicity, and harmony with nature.



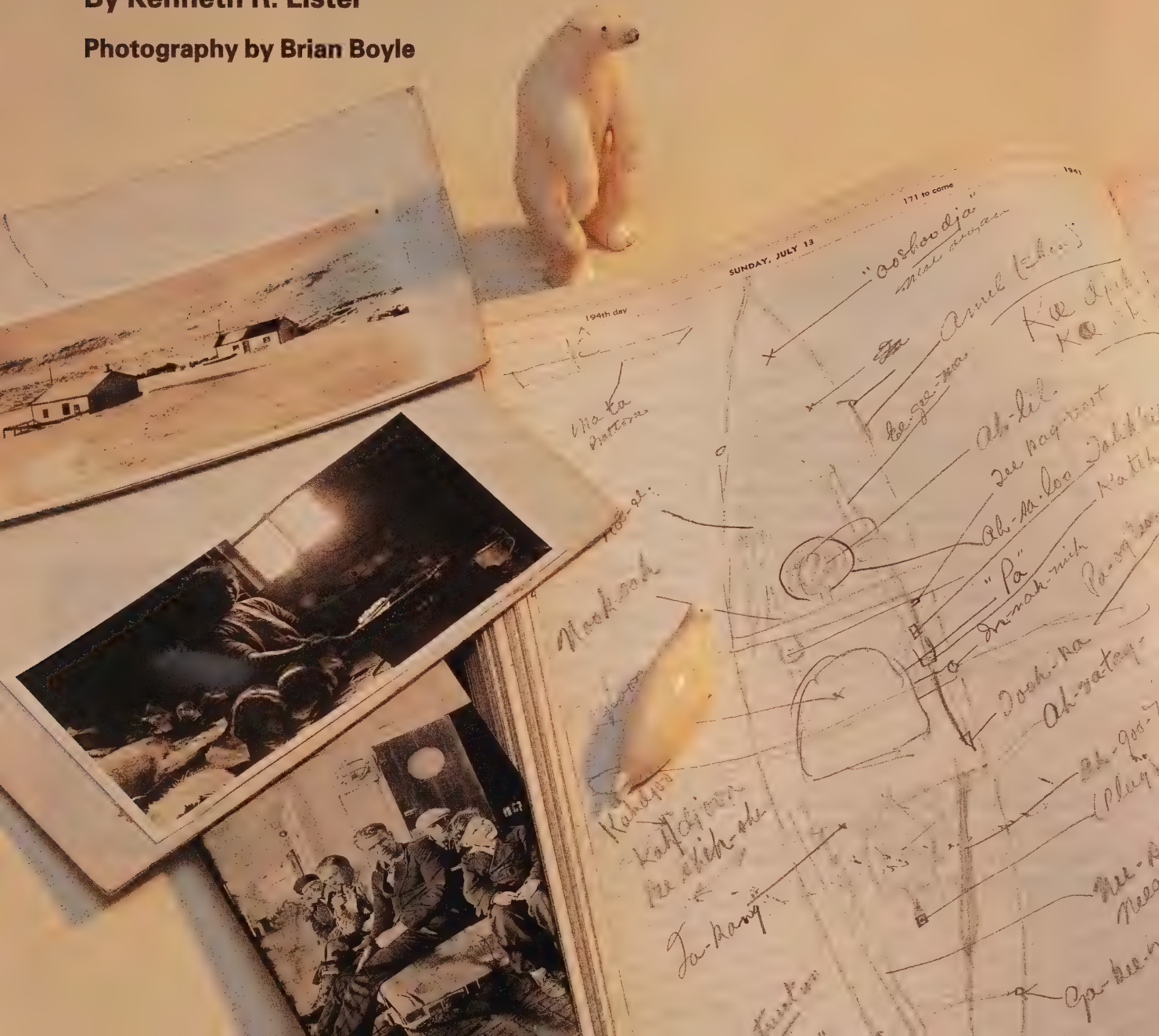
Opposite page: The ROM's album showing Hiroshige's print "Fireworks at Ryôgoku" at right. The lightened sky behind the burst of fireworks suggests it is a first state, or first edition, print. Above: A separate impression of the same print lacks the lightened sky, indicating that it is a later impression.

The Inquisitive

On Baffin Island in the 1930s and early 1940s, a young Winnipeg-born doctor immersed himself in a tiny Inuit community, acquiring what is now recognized as a national treasure.

By Kenneth R. Lister

Photography by Brian Boyle



Dr. Bildfell

a lot of meddling

So with the white man came easier times, mental and bodily, ammunition (a good thing), tea, rifles, biscuits, tobacco, yards of material to satisfy native self display, boats, white. . . real genuine Nordic blood, tuberculosis, . . . and a lot of meddling in such incidental things as child-birth, marriage, counting the people, inquiries into insanity, sickness, ...

In 1933 and 1934, 28-year-old Jon Bildfell spent a year as resident doctor in the Inuit community of Pangnirtung, Baffin Island. There, the young Winnipeg-born physician's most demanding medical challenge was treating and managing rampant tuberculosis—once known as consumption—first introduced to the Inuit of the Cumberland Sound area by white whaling crews.

The devastating effects of this lung disease, spread through contact with those infected with active tuberculosis, reveal themselves in the population statistics: In 1840, when the first whalers arrived in the Cumberland Sound region, an estimated 1000 people lived in the area; by 1857 the population had dropped to 350, and by the mid-1880s to as low as 245. When Bildfell arrived in the Arctic in the 1930s, tuberculosis was so widespread and so lethal that it was responsible for 80 percent of deaths. In Pangnirtung, Bildfell wrote:

Tuberculosis is so general among Pangnirtung Natives that to speculate on any particular percentage is impossible. If the maxim that every case of Tuberculosis begats three holds good in the north, then it is safe to say that every person in the district and every infant to be born is infected or will become infected.

Dr. Jon A. and Mrs. Muriel Bildfell. During his Arctic residence, Bildfell was Baffin Island's general representative for the Government of Canada and served as doctor, dentist, health officer, coroner, magistrate, and relief officer.

Bildfell's concerns went beyond treatment to causes, as he realized that Inuit living conditions fostered the spread of the disease. He connected his observation that women appeared to be more susceptible than men to the fact that women spent much more time in their homes with little fresh air and sunlight, while men stayed primarily out on the land, trapping and hunting. Childbirth, too, posed a great risk for exposure and dramatically increased infant infections. **It is not surprising,** wrote Bildfell, **that many of my histories of the disease trace the origin to the time of childbirth.** In an effort to help the Inuit understand the disease, Bildfell lectured about the effects of coughing near another person.

During this first stay in the Arctic and later during a two-year residence, Bildfell was interested in more than the medical conditions of the Inuit; his personal journals and letters are filled with his thoughts on Inuit socioeconomic conditions, his observations about their daily lives, and especially his own trade negotiations with them. For, in their quest to obtain the goods he had access to, he became a recipient of their art. Now, the 210 Inuit sculptures and artifacts Bildfell collected, along with associated journals, letters, reports, photographs, and film, acquired by the ROM in 1997, together have been recognized by the Canadian Cultural Property Review Board as a Canadian national treasure.

It is a rare museum collection that marries artifacts with the thoughts of the collector. This fortuitous combination allows for unique insight into Inuit life in the 1930s and early 1940s, when a crucial period of change was underway in the Arctic.

When Bildfell first sailed into Cumberland Sound and Pangnirtung Fiord in 1933, the traditional Inuit culture of living totally from the land had been under stress for nearly a century. The first major influence from outsiders came in 1840 when Scottish whaling captain William Penny discovered Cumberland Sound's vast richness of bowhead whales. In the early 1850s, whalers first began to winter over in Cum-

The Bildfell house and storehouse on Pangnirtung Fiord.
All archival photographs are from the Dr. Jon A. and Mrs. Muriel Bildfell Collection gifted by the Bildfell Family.

berland Sound, and opportunities for employment—either full-time or to offset their seasonal hunting and fishing—attracted the Inuit to settle near the whaling stations. By the end of the 19th century, disease—as well as foreign goods—had become established as part of Inuit life, and the shift from traditional Inuit ways to a way of life based on exchange was well underway.

The effects of this change continued into Bildfell's time. His letters and entries in his journals express his concern about the growing dependence of the Inuit on flour, tea, and biscuits; their heavy concentration on trapping foxes for skins to trade with the Hudson's Bay Company; their adoption of European textiles to the neglect of their more superior traditional fur clothing; and their use of expensive coal oil in the place of seal oil for light and heat. In Bildfell's view, the "white man's" influences were detrimental, eroding the Inuit sense of self-esteem. In a letter to his mother written during the 1933–34 residence, he was quite outspoken about the white man's "meddling":

Inuit woman tending a seal-oil lamp inside a manufactured home. Women appeared much more susceptible than men to tuberculosis because of the time spent indoors.

With the white man came many things. Everywhere [he] tracks there is to be found traces, often pathetic traces, of his super self. The last word in wisdom, in religion, in everything. So plowing his way over the globe in the spirit of good will he found himself in the Arctic telling these people that the stuff their father told them is all bosh.

Bildfell grieved about the ongoing effects of foreign pressures on Inuit culture, and in the following passage from his 1933–34 journal, he reflects, with humour, on what he imagines a group of Inuit are thinking as they listen to a Depression-era radio speech by Canadian Prime Minister Richard B. Bennett:

I don't suppose that they were very interested in what Bennett had to say, or they may have laughed at such conditions as exist outside and suggested the remedy — To do as they do. There is plenty of seal in the sea, and deer inland, and if any person is wanting we provide them with food and shelter as a duty to the community in which we live. . . . All I want from you Bennett—and it is you who have taught me to like these articles and use them—are cartridges, tea, tobacco, biscuits; and we do not want your bacteriums, they can remain with the forlorn civilized.

Map of the Eastern Canadian Arctic

Pangnirtung, "the place of the bull caribou," was established in the 1920s on the east coast of Pangnirtung Fiord, which drains into the expansive Cumberland Sound on Baffin Island's southeastern side.

the greatest experience in living

In the fall of 1934, Bildfell left the Arctic and set up a medical practice in Saskatchewan as a country doctor. But he remained enamoured of the Inuit and their Arctic landscape and yearned to return north. His opportunity came in the summer of 1940 when he saw an advertisement for a Pangnirtung doctor in the *Winnipeg Free Press*. By this time Bildfell was married and had a son. In her writings, his wife, Muriel, recalled her anxiety:

I appealed to him for reassurance that this departure from conventional living was not a blunder. Constantly, I wondered how the change would effect [sic] the health and welfare of our son. Were we introducing any harmful elements into his life? Would the long voyage upset him? Had it been wise to remove him from his normal environment? Would there be any serious deficiencies

Ivory seal. Pangnirtung, Nunavut. *All sculptures are from the Dr. Jon A. and Mrs. Muriel Bildfell Collection purchased through the generosity of Mr. Donald Ross.*

in his restricted diet? Would the monotony of Arctic living impede his mental progress?

Her husband's response, recorded in Muriel's writings, if not replete with details, was nevertheless convincing: **Pangnirtung is an ideal place to bring up small children and as for yourself, my dear, you are about to enter upon the greatest experience in living of which you have ever dreamed.** Within a week, the Bildfell family was well into preparing for their new Arctic life. Once in Pangnirtung, Muriel appears to have agreed with her husband's estimation of the northern life for, as explained in a 1941 letter to friends, the Bildfells decided to stay for an additional year. **At first, the Bildfells intended that this one year should be only an interlude in the 'desperate struggle for an existence,' but they have found things so delightfully free, tranquil, normal and pleasant up here . . . that they have unanimously decided to remain . . . for another year.** When they returned south in 1942, they had two more children, both born in Pangnirtung.

Ivory woman in sitting position Pangnirtung, Nunavut

the deal commenced

As much as Bildfell was critical of what he called the White man's "meddling," it is ironic that he, himself, was drawn into this commercial circle. As the Inuit responded to the changing times, they began to turn their attention to creating sculptures of their experiences and found that there was a demand by non-Natives for works showing the animals they hunted, hunting equipment they used, and images of themselves. They also produced sculptures of non-Native objects, such as finials for narwhal-tusk walking canes, eating utensils, letter openers, and buttons. While a long tradition existed of carving objects for personal use, in the new market-oriented economy, sculptures became an important commodity, and by the 1930s when Bildfell first went to the Arctic, the value of sculpture production to the Inuit economy was well established.

Consequently, Bildfell found himself enmeshed in the Inuit desire and need for imported goods. In return for food, cartridges, and coal oil, he received small ivory sculptures carved specifically for trade. Through this trade, Bildfell further encouraged the Inuit to embrace a market-oriented economy and the concomitant dependence on non-Native items. But it was an uneasy fit, and in the privacy of his personal journal he expressed his ambivalence about being caught between Inuit desires and his own philosophy:

This morning Natives appeared with articles for trade. I did not want anything they had, but gave them what they asked for. I simply can't help it and I became very annoyed at myself.

Bildfell was both a passive and a proactive collector. He collected sculptures from carvers who arrived unexpectedly at his door with pieces to sell on speculation, and he also commissioned works from specific carvers. In his 1933–34 journal he provides insight into the process of unsolicited trade while praising the talents of Appa, a carver he refers to as the "Genius of Pang," upon his death:

This was the passing of the Genius of Pang. . . . The man who was famous for originality in carving. Many of his designs have not been solved to this day and probably will never be. I am fortunate to have some of

them. We all have some. He turned them out as fast as a highly specialized factory. Trees, ducks, aeroplanes, games, and riddles. I will never forget Appa arriving usually at a late hour [after he] patiently canvassed the whole village, at my igloo, and while I would be reading something of interest, he would arrive. . . . He seldom came alone. Often he would bring some other youngster with him . . . and try newer methods of salesmanship . . . He would hand the article—skins, tobacco pouch, mitts, meat, ivory, anything he apparently put his hand on—over to these kids.

Ivory polar bear. Pangnirtung, Nunavut

In the same journal, Bildfell describes a similar encounter between himself and two young women, who arrived wanting to exchange a walrus tusk for candy:

This afternoon as I was having one of my famous tin can plates—sardines, potatoes and cheese, bread and butter, tea and chocolate biscuits—a couple of young women came to trade a tusk. One of them I recognized as Martha. They did not enter immediately but remained outside a while likely planning their approach and bargain. They entered and stopped just inside the door, tusk in hand so as I would be sure to see clearly the purpose of their visit. I stretched out my hand indicating that I wished to see the tusk. She marched timidly forward, placed the tusk in my hand and at once retired to take up her position at the door [and] as both of them stood absolutely motionless while I finished my meal I offered them tea and a chocolate biscuit. They enjoyed it. Then the bargaining began and she claimed that she wanted okomega. Believing that she wanted the same as the young lad who brought me the tusks on a previous occasion I produced the sugar, but the lady screwed up her face to indicate that she did not want that, but okomega. "Oh! You want okomega!" I then produced biscuits. No, that was not it and she screwed her face up again. Finally after a few facial contortions I asked her to take a look in the cupboard. She could not find okomega there so I handed her some unsweetened chocolate and her face brightened to indicate that I had it. I asked her to taste it and she screwed up her face with emphasis this time to indicate that although I had been close that this above all was terrible tho [sic] the colour was right. I threw up my hands, Martha spoke to her and she then points to my storehouse. We went out there, the girls followed and as I asked her to come into my inner compartment Martha gave her a push and without a moment's hesitation pointed to a green box on a top shelf. I was not familiar with its contents and when I opened it I was surprised to find that it contained okomega—candy. Hard fruit bits. The rest was easy and they went away satisfied.

When Bildfell commissioned sculptures, his style of bargaining did not always work to his favour, as an exchange with his hired man, Etuangat, noted in his journal in the early '40s, reveals. **I wished him to do some carving for me**, states Bildfell, who wanted to commission a plaque. Etuangat then asked about *kinouja*, which means dollars. But Bildfell dismissed the subject. Upon further enquiry the next day, Etuangat stated that he would get more if he was paid a set price for each carving completed. Bildfell notes: **I wished him to carve without any set price since he was my hired**

Ivory hunter paddling a qajaq (kayak) loaded with hunting equipment. Pangnirtung, Nunavut.

Top: Ivory hunter, qamutiik (sled), and dog team. Pangnirtung, Nunavut. Bottom: Ivory bird flying through brush. Thought to have been carved by Appa. Pangnirtung, Nunavut.

man and . . . should gamble on what I gave him. In Bildfell's view, by trusting him to pay what he thought the item was worth when it was completed, Etuangat would get more than if he was dealt with on a Hudson's Bay Company basis. In the end, it appears that the carving was not completed.

Although Bildfell commissioned specific sculptures, the price of the trade was not set until the carving was delivered. And even then, the process was not straightforward:

[Curious is the] attitude of a native when he brings an article for your inspection or sale especially if it has been ordered according to directions. On arriving they say nothing, look blank, perhaps a suspicious or give away look in their eyes or hesitant speech. . . .

This was the case with Thomasee who appeared this noon, seated himself on a chair in the porch and (did not cough) waited. . . . I knew that he had the ivory kayak with him and intended at his good time to present it for my inspection. Perhaps there were too many natives around . . . and such inferior work (he being a novice) may bring on ridicule, disapproval, laughter. He was uncertain as to how good it was so he took no chances on being embarrassed.

Finally I left him to his own good time, returned to my book in the sitting room. After about a half an hour he appeared at the kitchen door, giggling . . . with the article wrapped (they always wrap ivory) in newsprint. I examined it and praised it and the deal commenced.

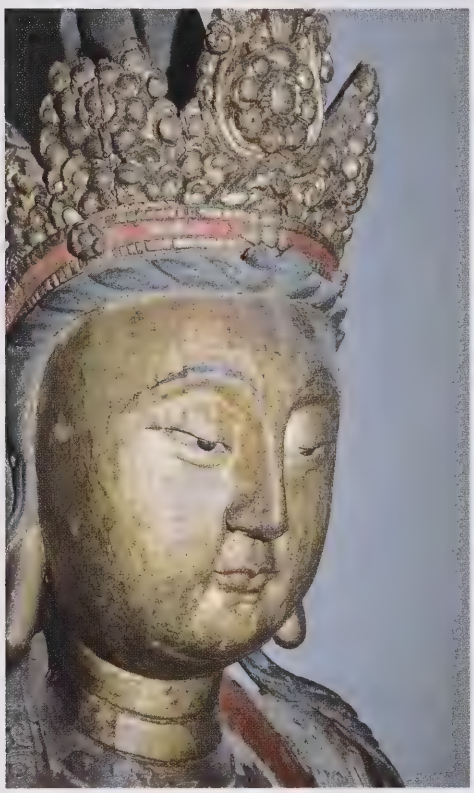
All artifacts possess contexts—cultural and historical—but in the abyss of time these contexts often vanish. The Bildfell Collection is an exception. In writing about the fabric of relationships into which he was intricately woven in the Pangnirtung community, in recording the nuances of the trading process, and by ensuring that his documentation and sculptures remained together, Bildfell vividly captured a moment in Inuit history. And our view of that moment is greatly enriched by the reflections of Dr. Bildfell's inquisitive mind.

The title of this paper, *The Inquisitive Dr. Bildfell*, was inspired by Philip Goldring's reference to Dr. Bildfell in his article "Inuit Economic Responses to Euro-American Contacts: Southeast Baffin Island, 1824–1940," in Kenneth S. Coates and William R. Morrison, *Interpreting Canada's North: Selected Readings*, Copp Clark Pitman Ltd., 1989, p.270.

An exhibition featuring The Dr. Jon A. and Mrs. Muriel Bildfell Collection, called *Tuugaaq: Ivory Sculptures from the Eastern Canadian Arctic*, opens on October 12, 2002, in the ROM's Gallery of Indigenous Peoples.

Missing Pieces: A Conservator's Dilemma

For curators and art conservators, the question of when to replace missing parts of art objects and artifacts is an ongoing challenge.



GILLIAN WATTS, ROM / 923.1.9

MARIANNE WEBB, ROM / 923.1.7

Left: The intact crown points on this Bodhisattva were copied to recreate the missing tips on the adjacent sculpture.

Right: The lost points from the crown of this wooden Bodhisattva, on display in the Bishop White Gallery, have been replaced with wood carvings. The finish on the new pieces is slightly different, to distinguish them from the original.

DOUGLAS CONVERSE AND MARIANNE WEBB

CAN YOU PICTURE the Venus de Milo with arms? Incomplete as it is, the sculpture is one of the most famous and readily recognized pieces of art in the world. Would re-attaching the arms be appropriate? At the ROM, as at all museums, curators and professionals in art conservation constantly face the question of when it is fitting to replace missing parts of art objects.

Adding replacement pieces, or appendages that attach separately to an object—such as a handle on a ceramic pot or a leg on a chair—differs from making fills, which are merely repairs made to objects with cracks or gaps. There are several reasons conservators might decide to add replacement parts: the most important is to preserve the object's structural integrity. This kind of replacement is not optional. Structural soundness dictates whether an object will be able to withstand display or travel; without it the object is at risk of further damage.

But there are two other, more subjective, reasons conservators might consider replacing parts. The first is to create a correct in-

terpretation—an accurate depiction of the object's function or the intent of its creator. The other is to restore the object's visual aesthetic, to make it more pleasing to view when on display. The work in both these cases, unlike replacements for structural support, is a matter of choice—and may even be a cause of great debate.

A part can be added only if the curators know exactly what was missing. The replacement must blend with the object exactly as the original piece would have. Research of similar objects from the same time period or geographic location, even early photographs, help determine what is correct. If there is uncertainty about the object's original appearance, then conservators will not attempt to make a replacement part. It is better to display an incomplete object than risk an incorrect interpretation.

Throughout the ROM, many artifacts contain replacement parts, including the middle bodhisattva in a group of three on the south wall of the Bishop White Gallery. Two points missing from the right-hand side of the bodhisattva's crown were replaced with replicas carved from wood. This replacement was easy to do because the points were simply mirror images of points on the left-hand side of the crown. Curators knew the crown's sides mirrored each other, because the other two sculptures in this triad had intact crowns.

Another example is a handle for a Torah scroll currently on display in the ROM's Judaica Gallery. The handle was missing two decorative elements carved from bone. The conservator decided that the handle would be more visually appealing with the missing parts replaced. To recreate the elements, a mould was taken from one of the existing decorations. Copies were cast in polyester resin and dyed to match the existing bone. Today, visitors can view the object in its complete form, as originally conceived.

Musical instruments are often candidates for replacement parts. Frequently, only a few of the original

MARRIANNE WEBB, ROM / 999.119.81

Top: The loss of two decorative circles disfigures this Torah scroll handle. **Bottom:** New parts, cast in polyester resin and dyed to match the original ivory, are shown in this photo of the restored handle.

strings remain, making it difficult for visitors to fully appreciate how the instrument should look. While most people know a violin has four strings, other instruments, such as the zither or the hurdy-gurdy, which have fallen out of common use, are best displayed with all their strings. Visitors can better appreciate the difficulty of playing such instruments when they are shown intact, and can more fully imagine the diversity of sound they might create.

Materials used to replicate missing parts are often not the same as those originally used. On musical instruments, for example, original strings are most often made of gut, but conservators make replacement versions from heavy cotton thread dyed to match the originals. (The new strings are not strung tightly, so there is no stress on the tuning pins.) The use of modern materials has the added benefit of ensuring that future museum staff will not confuse later additions with original parts. Rarity of original materials can also be a concern. Museums are keenly aware of international law, and don't use endangered species or other restricted material for object repair or restorations. Instead, modern plastic resins may be cast, shaped, and carved to recreate missing parts such as ivory.

How much restoration is too much? It can be argued that replacing too many parts may "over-restore" an object. Artifacts from antiquity are expected to have parts missing or broken, indicating the object's age, and its fragility. No one expects objects in a museum to look as if they are brand new. There are numerous ROM objects whose missing parts have not been replaced. Many sculptures in the Greek and Roman gallery, for example, are missing arms and legs.

Most often, limbs and hands are not replaced on sculptured figures because there is not enough information to determine exactly how the missing piece should appear. On many Asian religious sculptures, for example, hand positions are significant to the figure's meaning and interpretation. Incorrect replacement could seriously misrepresent the cultural meaning of such sculptures.

Nobody knows how the Venus de Milo's arms looked originally—that is why the arms have never been replaced. And, after all, that is how she is best known.

Marianne Webb is the Museum's decorative arts conservator. Douglas Converse is a writer with a keen interest in conservation.

Ivory Choice

Can an unusual find at the Oak Ridges Moraine tell us about the Ice Age elephants in North America?

Dear ROM,

We found what we think is a chunk of tusk eroding out of the moraine behind our house. Is it really tusk? Can you tell me what kind of animal it came from and how old it is? Do you think there might be more of the animal in the ground? We took the piece to an identification clinic at the Elman W. Campbell Museum in nearby Newmarket, and they thought it was a piece of tusk, too, and suggested I contact you for more information.

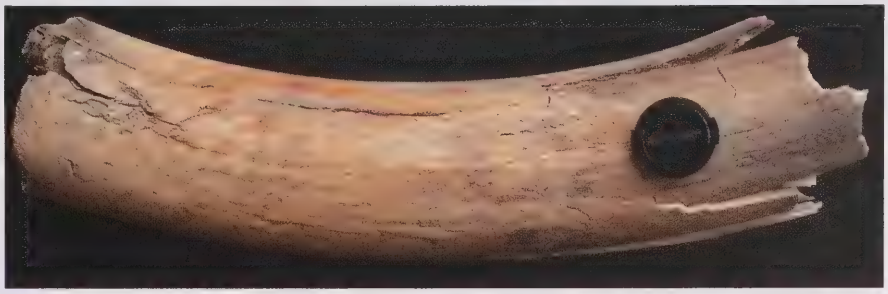
M.V.H., Tottenham, Ont.

Dear M. V. H.,

Yes, you do indeed have a piece of tusk of a mammoth or mastodon. Fossil tusks have been found throughout southern Ontario, but almost always from boggy areas. Your piece from the Oak Ridges Moraine is an unusual occurrence (more on this later).

Unfortunately, I cannot tell you which of the two species the tusk is from. Identifiable remains of both mammoth (*Mammuthus primigenius*) and mastodon (*Mammut americanum*) have been found in Ontario. Both animals were large, similarly sized species of elephants, having different skull and tooth structures. In total, more than 115 finds have been recorded in Ontario, most being single teeth or pieces of tusk. More than half of the identifiable remains have been of mastodon, whose tusks tend to be less curved and shorter than mammoth tusks. Your piece, however, is too small for us to see these features.

Some palaeontologists have proposed that differences between mammoth and mastodon tusk fragments can be determined by the internal structure of the fossil ivory. So far, this work has been done only on a small sample, and further efforts are needed to account for tusk variation (in sex, age, and location). As well, additional work needs to focus on tusks that are



KEVIN SEYMOUR, ROM

BRIAN BOYLE, ROM

Top: M. V. H. 's specimen of an Ice-Age elephant tusk. **Bottom:** The mastodon specimen currently in the ROM's gallery.

KEVIN SEYMOUR

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associated with identifiable skeletal elements. Skeletal elements can be sexed and aged independently from the tusk to help us understand the variation in internal tusk structure. Although the ROM collection holds a number of good tusks, most are isolated finds such as yours. Only four ROM tusks are associated with bones; the best of these, found in 1912 near Welland, Ontario, is presently in our gallery. Until this work can be completed, we can't be certain whether your specimen is from a mammoth or a mastodon.

Both species became extinct on this continent about 10,000 years ago. The Oak Ridges Moraine, the moraine that has been in the press recently, and in which your piece of tusk was preserved, was laid down during the retreat of the glaciers from southern Ontario around 12,000 years ago. So your piece of tusk undoubtedly dates from this fairly narrow time interval, between 10,000 and 12,000 years ago.

Elephant bones in Ontario are most commonly preserved in bog deposits, where partial or almost complete skeletons have been found, representing the actual spot where the animal died. What is unusual about your find is that not only is it from a moraine, but you know the spot where it was preserved. Most fossils discovered from moraines are recovered during sand or gravel pit operations, and their exact locations of discovery remain unknown.

When I visited your property to assess the sediments, it turned out that your tusk fragment was found in sand laid down in a lake or river associated with the glacier, and so I suspect that you will not find any more of the animal preserved there. Typically, these kinds of finds are single pieces that have washed down a river away from the rest of the skeleton.

Thank you for bringing your find to our attention.

Dr. Kevin Seymour is an assistant curator in the Museum's Department of Palaeobiology.

Cellini Myth

A popular 19th-century silver pattern owes more to the era's confusion of artists and fondness for name-dropping than to Cellini himself.

Dear ROM Answers,

We have a flagon and two goblets in silver, which were passed down in the family from a great-uncle who died years ago. This set was probably acquired when he travelled to England sometime before 1910. Each piece has a full set of London hallmarks, but I cannot identify the maker's mark. Can you tell me something about these pieces?

C. R.
Etobicoke (Toronto)
Ontario

Dear Reader,

The design of your ewer, or flagon, and goblets was popular with English silversmiths in the 19th century, when it acquired the name "Cellini pattern." There is a similar set at the Royal Ontario Museum. The Cellini appellation, however, is deceiving. The pattern has no direct connection with Cellini, but instead reflects the 19th-century penchant for name-dropping by trying to associate a traditional design with a great artist of the past— in this case, the Italian Benevenuto Cellini (1500–1571), who across the centuries has come to be revered as the greatest goldsmith/silversmith of all time.

The Cellini pattern exemplifies a 19th-century movement called historicism, which, as the name implies, amounts to a revival of earlier styles. In the 19th century, your set was understood as Renaissance Revival, although strictly speaking it is Mannerist in style. Mannerism, which succeeded the Renaissance, was dominant during the late 16th century and is characterized by preciosity, sensuousness, and technical virtuosity.

BRIAN BOYLE, ROM 971.230.A-C

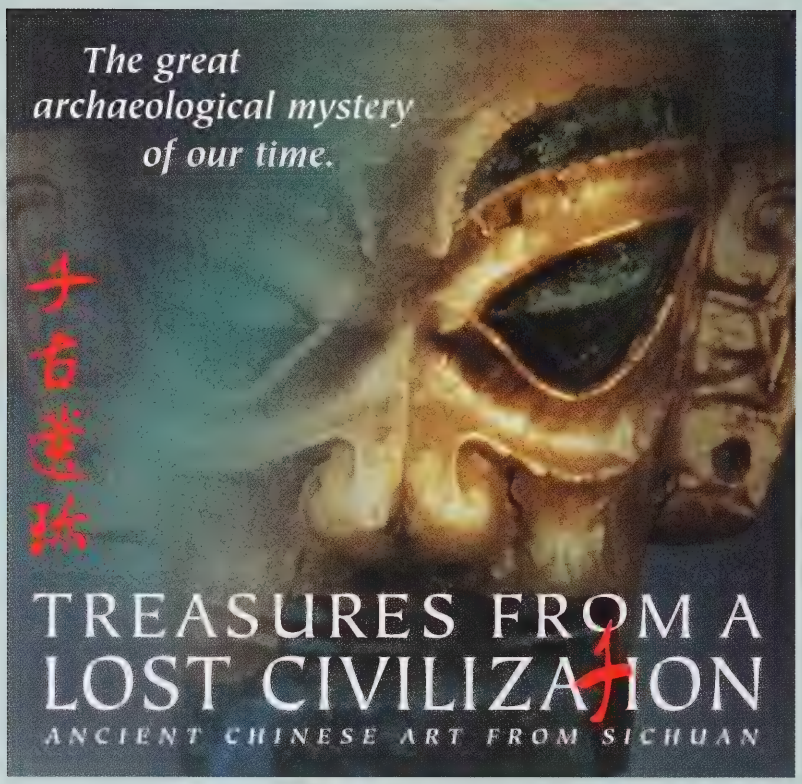
ROSS FOX

Above: C.R.'s ewer and goblet by Charles Thomas & George Fox, London, 1871/73.
Below: ROM's ewer and goblet by Daniel John & Charles Houle, London, 1873/74. Royal Ontario Museum.

The basic Cellini pattern consists of all-over ornamentation in low relief. The body of the ewer is organized into three horizontal zones, or friezes. The central frieze consists of masks in medallions with interconnected strapwork. The masks are flanked, in quasi-heraldic fashion, by animals. Caryatids occupy the lower frieze and masks the upper frieze. The spaces between the three friezes have vegetal fill. This decorative vocabulary is ancient, ultimately derived from the ancient Greeks and Romans.

More often than not, ewers in this pattern are found alone, rather than with goblets in a set. In some instances, the goblets became separated from the ewer, but in others, the goblets simply did not exist. A random perusal of various publications, including auction catalogues, produced a number of ewers in the Cellini pattern. The earliest one I found is by the London silversmith William Elliott, and has hallmarks for 1827 (Sotheby's, New York, sale, 21 October 1998, lot 188).

There is an engraving of an ewer comparable to yours in the *Art-Journal Illustrated Catalogue* (p. 189) of the Crystal Palace or Great Exhibition of 1851 in London. It was displayed by the firm of Martin, Baskett & Martin of Cheltenham, a manufacturing jeweller and retailer. The notice calls it a "claret-jug, after Cellini, a sufficient



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guarantee for its beauty."

Most Cellini-pattern ewers, however, appear to date from later in the century. Your own ewer, by Charles Thomas & George Fox, dates from 1871/72. The goblets are impressed with the date-letter of London Goldsmiths' Hall for 1872/73. The ROM's set, by Daniel John & Charles Houle of London, dates from 1873/74. I was able to locate a number of similar ewers by various makers, all of them dating from the 1870s through the 1890s. All are solid (sterling) silver but it is conceivable that there are others in electroplate as well.

The motifs and details on these ewers vary slightly and the sizes differ somewhat. Otherwise they have a close kinship—more like versions of a pattern rather than exacting reproductions. Looking at your ewer and the ROM's, the most obvious differences in ornamentation are in the main frieze. While the ROM's has three identical pairs of flanking horses, yours has three different pairs of

WE'D LIKE TO HEAR FROM YOU

If you own furniture, silver, glass, metalwork, ceramics, textiles, or small decorative objects that may have an interesting past and have aroused your curiosity, this column is for you. Send a clear colour photograph (or 35-mm colour slide) of the object against a simple background, providing dimensions, a description, any markings, or any known details of its history to: ROM Answers, c/o *Rotunda* magazine, Royal Ontario Museum, 100 Queen's Park, Toronto, Ontario M5S 2C6. Be sure to enclose a stamped, self-addressed envelope large enough to include any photos that must be returned to you.

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Letters will be acknowledged as staff time permits.

COMING IN THE WINTER 2002 ISSUE

ROTUNDA

Where did Marie-Antoinette get her sense of style?

Textiles expert Kimberly Chrisman reveals France's unofficial minister of fashion in the Winter issue of Rotunda

flanking animals: rams, stags, and ostriches. Your ewer is close in design to the example by Elliott mentioned above. It also has close parallels to one by Hunt & Roskell (Christie's, London, sale, 24 May 1989, lot 123) and a later one by Stephen Smith & Son (Sotheby's Belgravia, sale, 8 May 1980, lot 284), among others.

Your ewer and those like it closely resemble a ewer found in the Kunstgewerbemuseum in Cologne. Made of pewter, this piece may in fact be the Mannerist antecedent for the revival-style Cellini pattern. Yours matches closely, down to the animal motif details of the main frieze.

The Cologne ewer is commonly attributed to an unidentified French pewterer of the third quarter of the 16th century. This piece and other pewter examples have design affinities with the work of François Briot (c. 1550–after 1616), whom art historians have long regarded as the leading pewterer of his generation.

Pewterware associated with Briot is unsurpassed in any period. As a great master of "display" pewter—prized possessions that would have been within the means of wealthy patrons only—Briot had many imitators. His designs emanate from the silver metalwork of the Fontainebleau School, a French variant of Mannerism. This style was introduced to the French court at Fontainbleau by Italian artists enlisted into the services of Francis I. Rosso Fiorentino was a leader among them, and Benevenuto Cellini worked at Fontainebleau from 1540 to 1545. Eventually the Italians were succeeded by younger French artists and craftsmen, who became the standard-bearers of a more national version of Mannerism.

A new revisionist rethinking of Briot proposes that he was neither a pewterer nor a silversmith (as has also been suggested.) According to Anthony North and Andrew Spira in *Pewter at the Victoria and Albert Museum* (1999, pp. 17-20), Briot was a specialist die-cutter and model-maker. That would more easily explain how his designs and influence spread so widely.

Briot had an even greater impact in Germany than in France. More than anywhere else, pewterers in Nuremberg excelled in fine quality pewter "à la Briot" during the later 16th and early 17th centuries.

While Briot had a considerable reputation in his own lifetime, it did not resonate on a par with that of Benevenuto Cellini. In subsequent centuries, Cellini continued to be regarded as a foremost Mannerist artist, whereas Briot's reputation waned.

Awareness of Cellini was perpetuated largely through his celebrated *Autobiography*, in which he describes his life and artistic output in great detail. In the early 19th century, a reappraisal of Cellini led to his elevated ranking, which approached that of Michelangelo and Leonardo da Vinci.

Cellini's mystique grew to such proportions that his name became an umbrella for much outstanding Mannerist metalwork without a documentable attribution. In reality, almost nothing of Cellini's gold and silver work survives. His best-known piece is a figural salt-cellar in the Kunsthistorisches Museum, Vienna. The paucity of surviving pieces explains the impulse to ascribe other metalwork to Cellini. This situation also accounts for 19th-century confusion of Briot and Cellini, especially since Briot was little known by that time. (For a summary of Cellini's activity as a silversmith, consult J. F. Hayward, *Virtuoso Goldsmiths 1540–1620.*

The popularity of the Cellini pattern in the 19th century reflects that era's high esteem for Mannerist metalwork. While the pattern does not derive directly from Cellini—or from François Briot—it does embody the high standards of design that were characteristic of Briot as a consummate metalworker.

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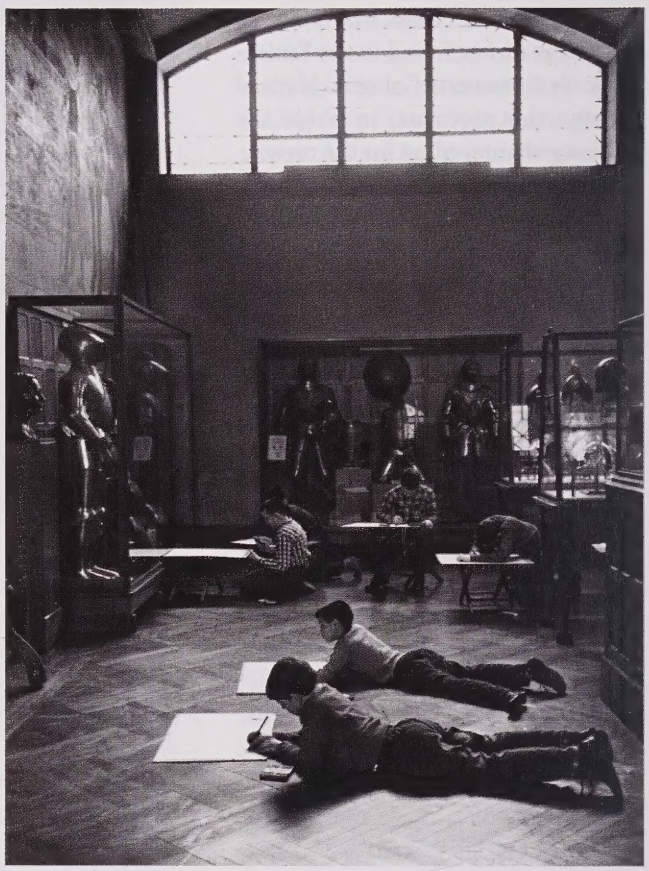
ARMOURED BACKDROP

Works of Steel Bridge Art and Science



In 1946, members of the ROM's Saturday Morning Club sketch in the Armour Court, known today as the Samuel Hall ✻ Currelly Gallery. Sunlight falling through the windows illuminates local artist Sylvia Hahn's wall mural in the top left (and shown above). It depicts a medieval tournament—with the faces of ROM staff painted on the figures.

At that time, the Armour Court occupied the crossbar of the ROM's "H"-shaped configuration. Charles Trick Currelly, first director of the Royal Ontario Museum of Archaeology, collected armour from many cultures and gave prominence to its display. He felt that the scientific forging of steel together with the design sense necessary for embellishing graceful suits of armour—similar to that required in glassmaking or weaving—made armour a universal bridge between art and science. A bust of Currelly keeps watch beside the case on the left.

JULIA MATTHEWS

Julia Matthews is head of the ROM's Library and Archives.

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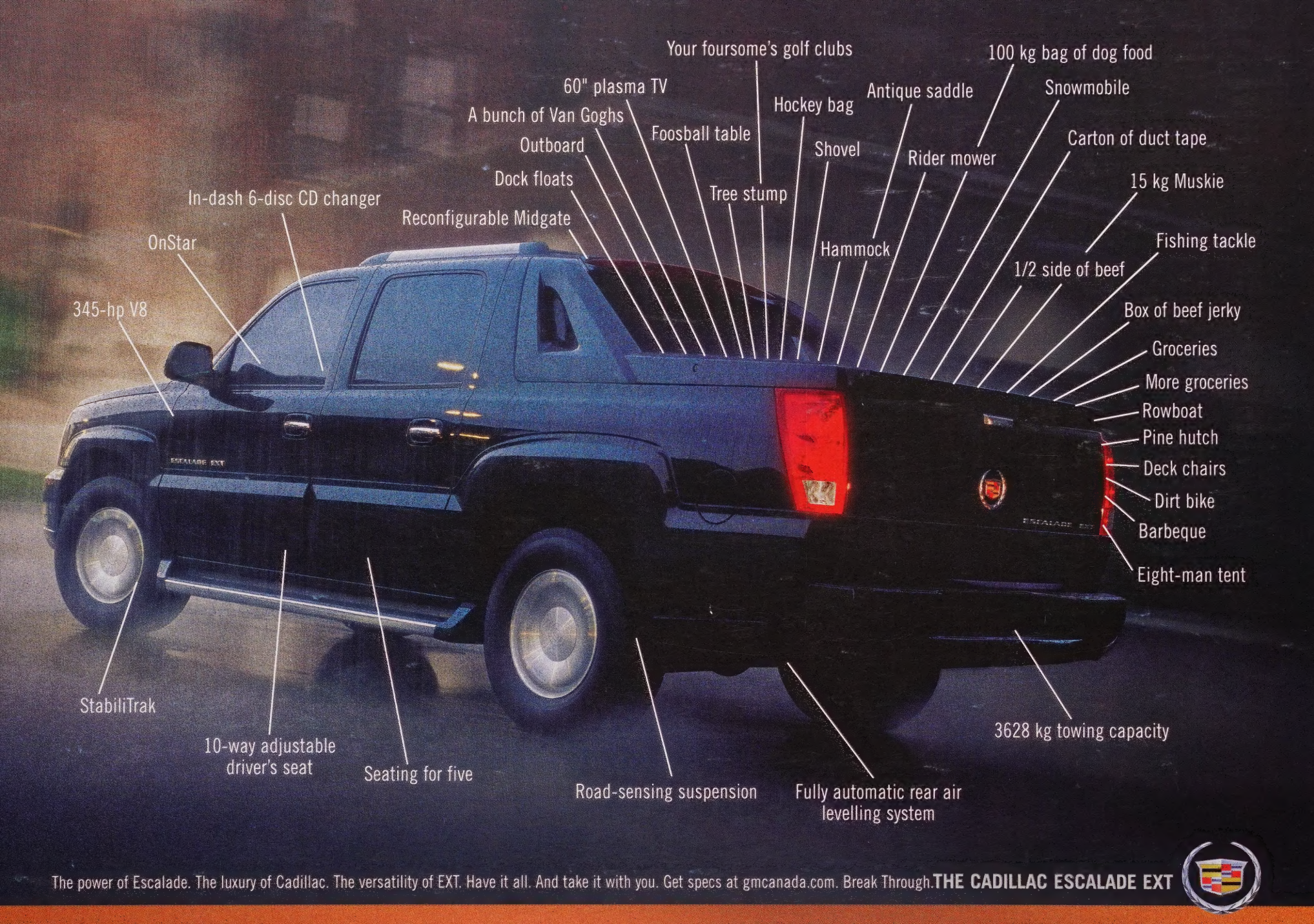

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